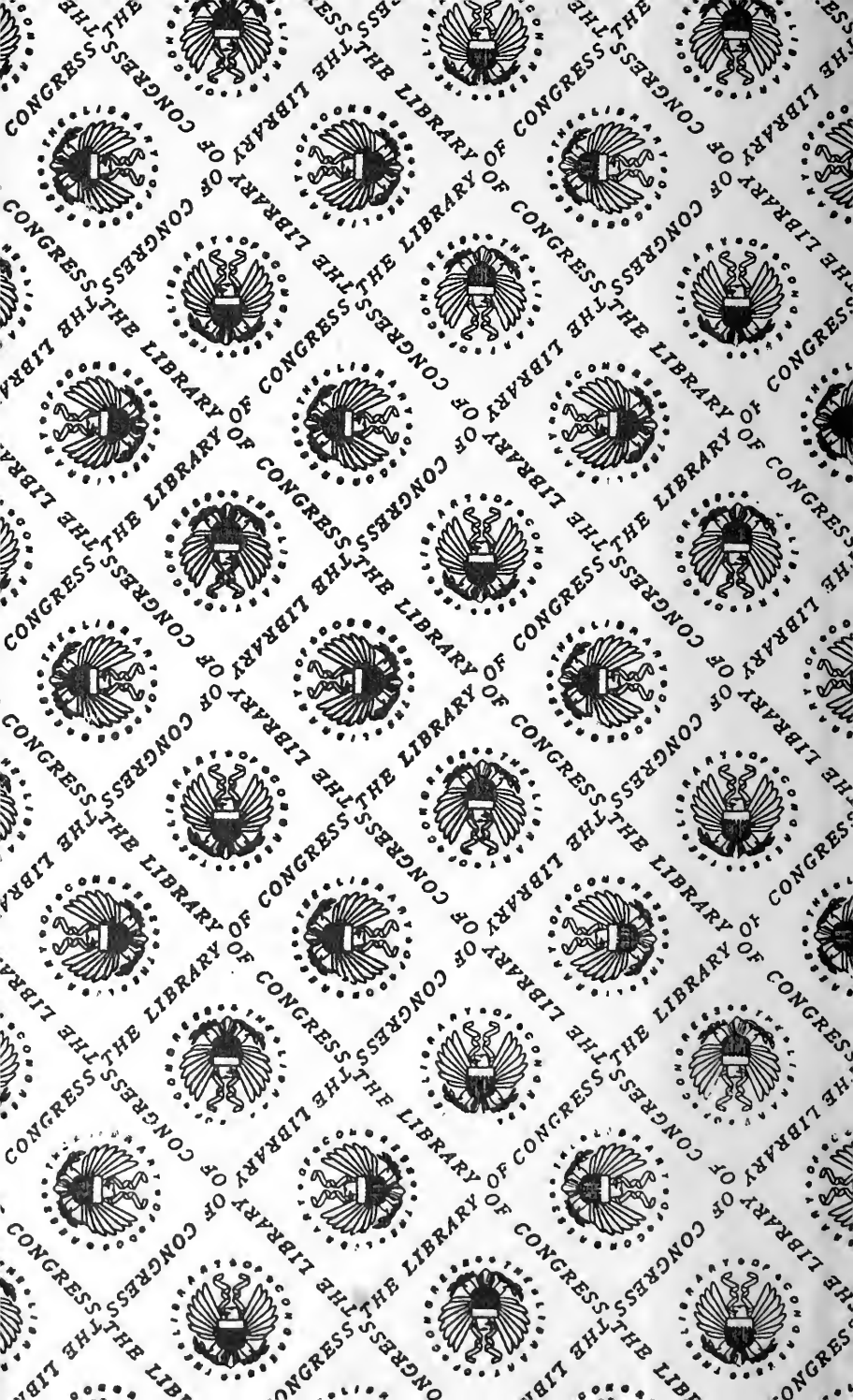
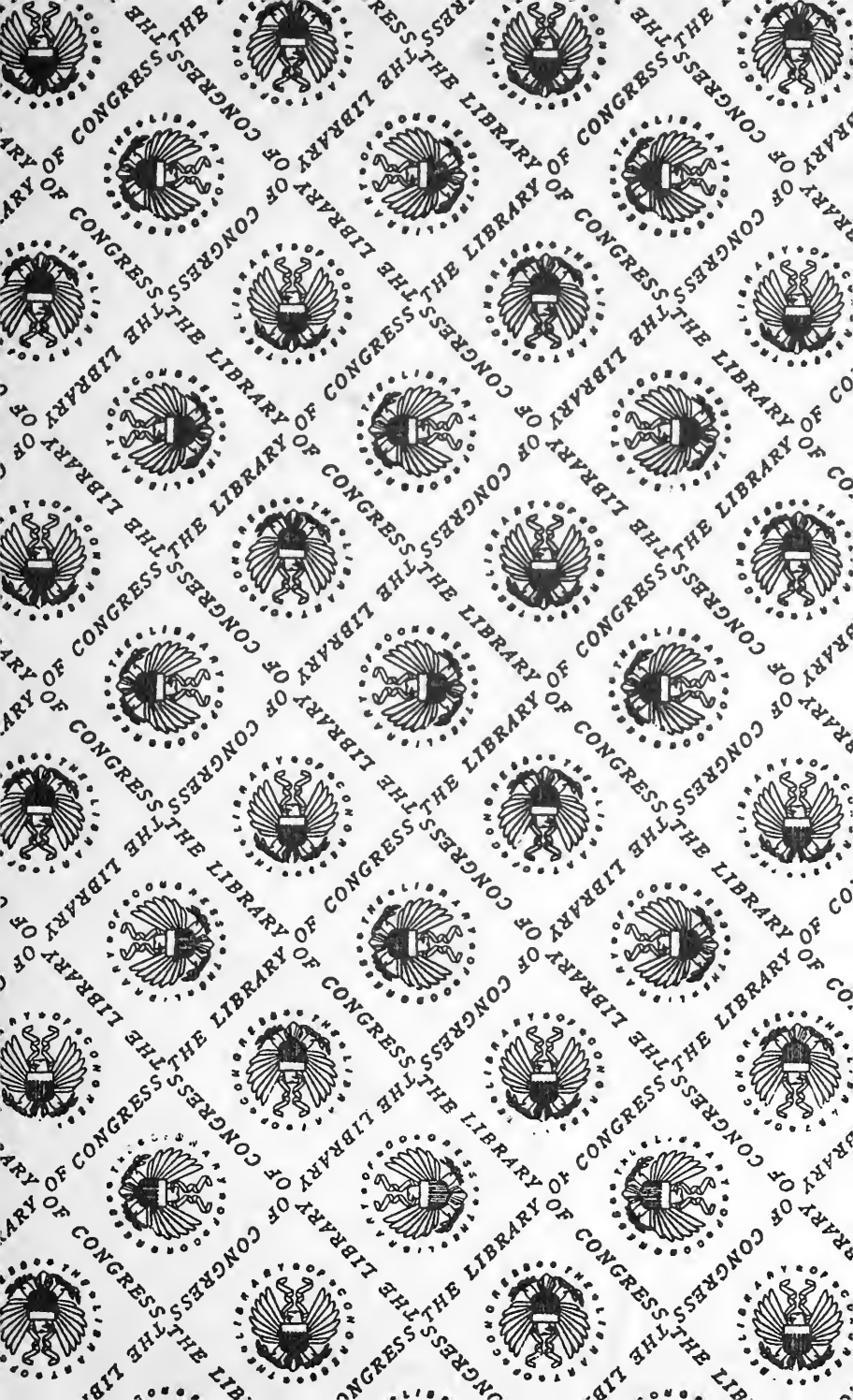


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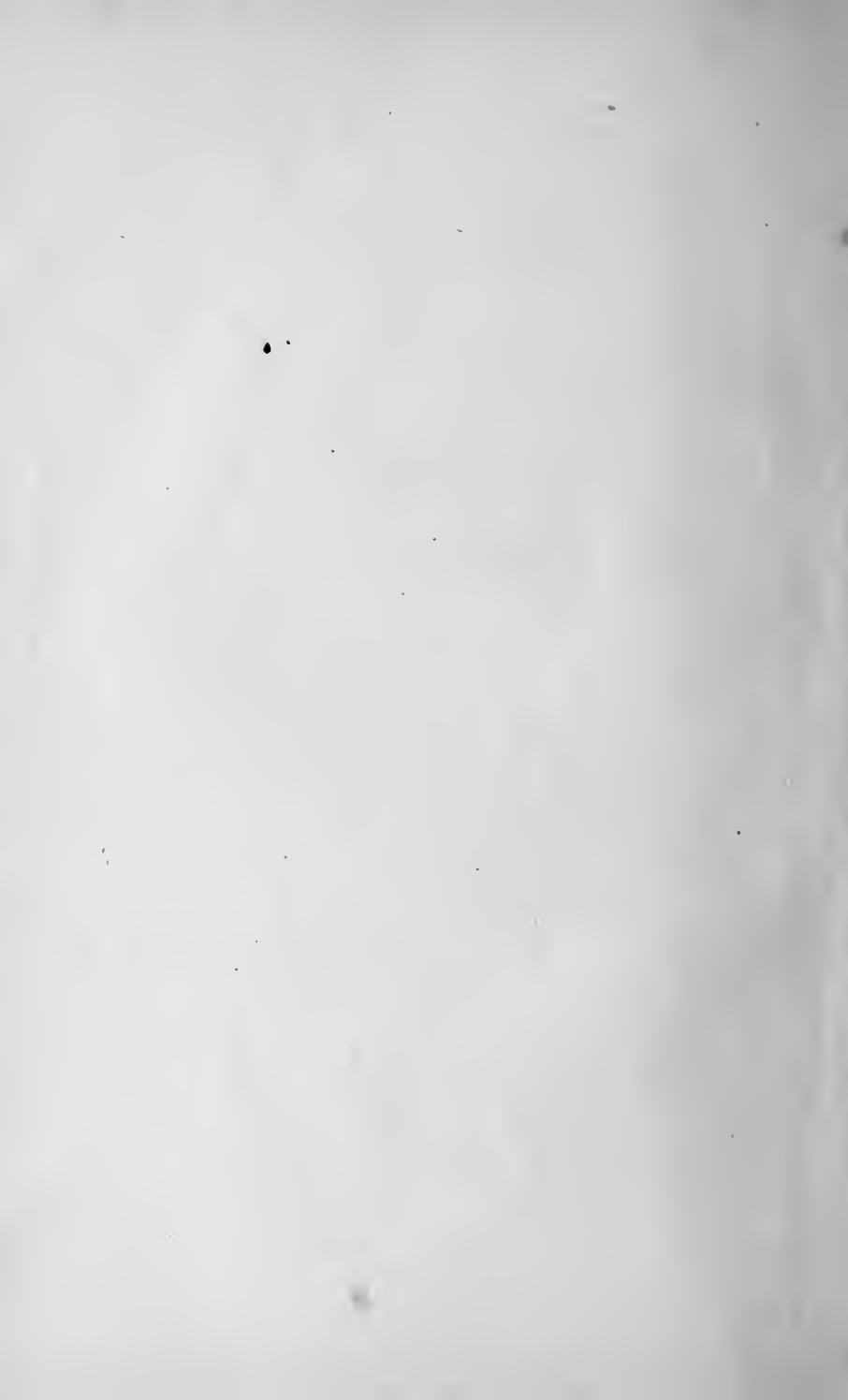
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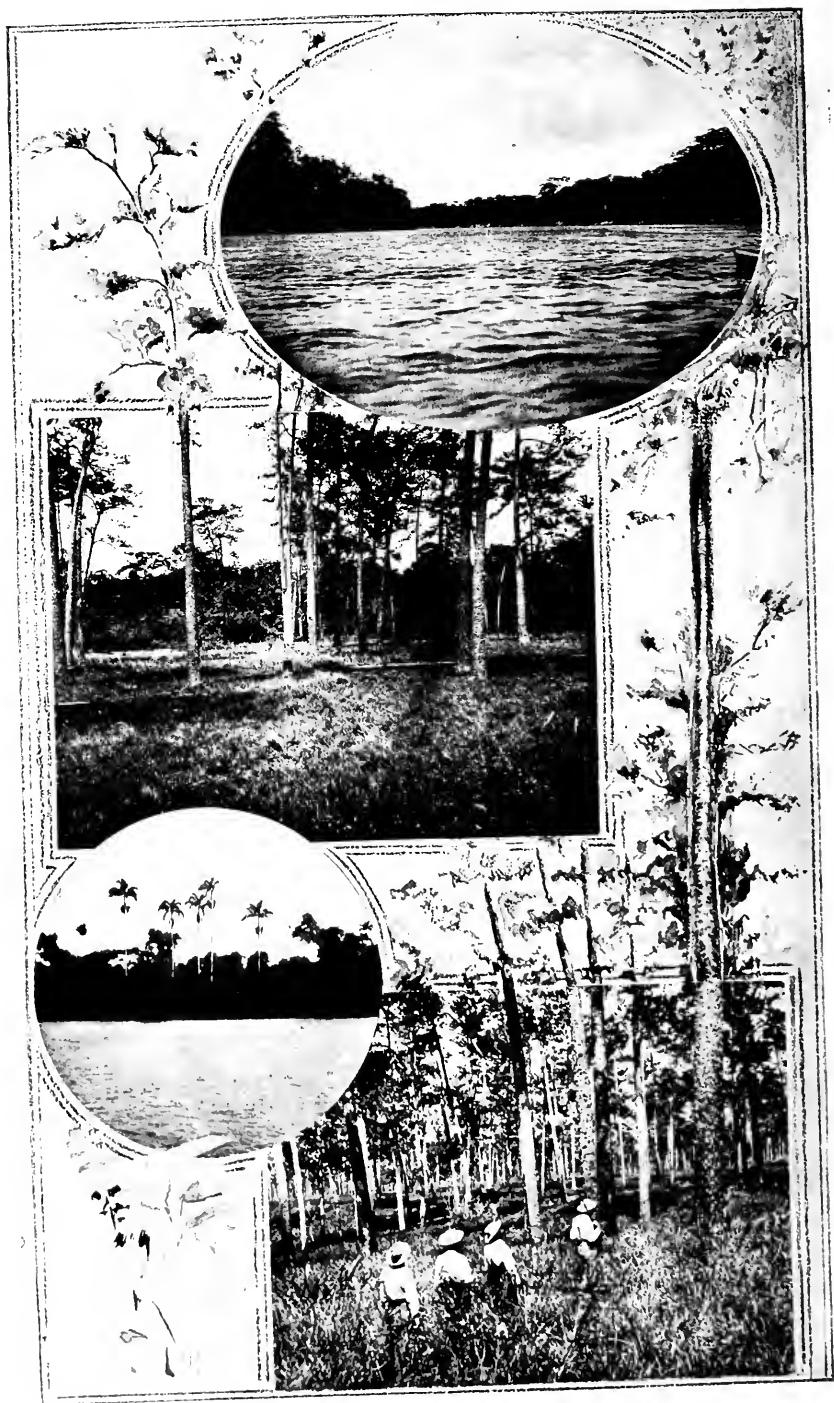




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FRONTISPIECE — SCENES ON PATUCA RIVER.

*The American-Honduras company,
Chicago.*

SPANISH HONDURAS,

ITS

RIVERS, LAGOONS, SAVANNAS, MOUNTAINS,
MINERALS, FORESTS, FISH, GAME,
AGRICULTURAL PRODUCTS, FRUITS,
TRANSPORTATION AND NATIVES.



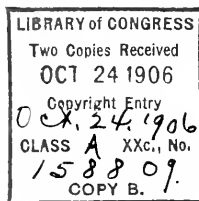
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INTRODUCTION.

Central America occupies that portion of the globe lying between North and South America and between the Caribbean Sea and the Pacific Ocean. Geographically, its northwestern extremity is at the Isthmus of Tehuantepec and its southwestern extremity at the Isthmus of Panama. Politically, it includes the British colony of Belize and five independent Republics. One of the largest three is the Republic of Honduras. To the west of Honduras lie the Republics of Guatemala and Salvador, to the south of it Nicaragua and Costa Rica. The area of Honduras is about five thousand square miles larger than that of the State of Pennsylvania. Its northern coast line is about 350 miles long. Its southern coast line nearly surrounds the Bay of Fonseca, and is seventy miles long. The surface is generally mountainous, but the central part of the Republic consists of a large plateau of 3,000 to 4,000 feet elevation above sea level. The country is drained by a number of rivers, the largest of which are the Uluá, the Aguan and the Patuca. Patuca River rises in the south central portion of the Republic, flows in a general northeast direction for a distance of 300 miles, and empties into the Caribbean Sea. It is the largest river between the Mississippi and the Magdalena. The highest mountain ranges are in the northern and western parts of the country. The highest peak is Mount Congrehoi, near the north coast, which rises more than 8,000 feet above sea level. The entire country, excepting only the higher mountain peaks, is covered either with a dense tropical growth, or with tall grasses. The alluvial soils of the valleys sustain a jungle, the hills and mountain sides a heavy growth of valuable hard woods and the plateaus comprise ideal grazing grounds. The mountains are rich in minerals. Gold, silver, copper, coal, iron and opals exist in abundance.

The modern history of Honduras dates back to the landing of Columbus on its north coast in 1502. That it was earlier peopled by a progressive race is shown in its vast ruins, the most noted of which are to be found in the department of Copan, and also near Catcamas, in the valley of the Patuca. Columbus laid claim to the country for the crown of Spain. This was followed

by the conquest of Cortez. From the landing of the latter until the people freed themselves from the Spanish yoke in 1821, the history of the country was similar to that of the other unfortunate peoples who were conquered by Spanish aggressiveness and treachery. Since 1821 Honduras has been a free and independent Republic, regularly electing a President and holding annual meetings of Congress, operating under a Constitution based upon that of the United States. In the four centuries which have elapsed since the discovery of Honduras by Columbus, that country has made practically no progress from a material point of view. None need have been expected during the Spanish rule. But the close of Spanish domination left a people of Spanish blood intermingled with the native Indian. These people lacked initiative and energy such as are found in the Anglo-Saxon race. They were poor, with no facilities whatever for transportation or manufacture. The principal business of the people became that of cattle raising, which required neither tools nor machinery. In addition, they grew corn, rice, casava, yams and tropical fruits. During the Spanish regime grape growing and wine making were carried on upon quite an extensive scale. But, when the products began to compete with the vineyards of the mother country, the vines of Honduras were ordered destroyed, and since that time the industry has never been revived. Tobacco growing has been, and is, conducted upon a large scale in the western portion of the Republic, and the leaf is shipped out in bales. Large quantities are also rolled into cigars and thus exported.

There are but fifty-eight miles of railway in the entire Republic. In 1867 an interoceanic railway was projected from the Gulf of Honduras on the north, to the Bay of Fonseca on the south. The promoters were London Hebrews, who induced the Government of Honduras to guarantee the bonds of the road. These bonds were sold principally in London and in Paris. The schemers received the money for them, built only thirty-seven miles of the 150 miles of road planned, and pocketed the balance of the funds, thus saddling an enormous debt upon the Republic, which debt to-day, with the accumulated interest, amounts to something like one hundred million dollars, a sum which the Republic of Honduras will never be able to pay, since heretofore they have not been able to meet even the interest on it. The deal was fraudulent, and was so declared by the British Parliament in 1875. Upon complaint of some of the bondholders, Parliament at that time appointed a committee to investigate the transaction, in order to determine the rights of the bondholders and the possibility of securing their money. This committee reported that the whole

matter was so tainted with fraud as not to deserve parliamentary consideration. Notwithstanding all this, the Republic of Honduras has never repudiated the debt, although it has been repeatedly urged to do so. This heavy obligation has handicapped the country in many ways. Owing to the weight of this great load, modern progress has been slower in Honduras than in any other of the Central American Republics. An American syndicate a few years ago extended this railway twenty-one miles farther, and the line has been in constant operation ever since. It transports annually over three million bunches of bananas, many passengers, large numbers of cattle, great quantities of lumber, hides, cocoanuts, rubber and general merchandise. Being the only rail line of transportation in the Republic, being less than sixty miles in length and tapping but a very limited territory, one would hardly expect it to pay operating expenses. Yet it returns a large surplus, which fact points to the ultimate success of transportation lines, which may be developed in other sections of Honduras.

Second to the railroad in importance as a line of communication is the macadam road from Tegucigalpa, the capital, ninety miles to the Bay of Fonseca, on the Pacific Coast. This road has occupied many years in building and has cost large sums. It is well graded and bridged. It is broad (in many places 40 meters), passes through fertile valleys, winds around beautiful hills, crosses great gorges, and affords the traveler an ever changing vista of the most delightful scenery, while riding in an azure atmosphere which renders existence not only a pleasure but a joy.

Travel through the balance of the country is accomplished only on mule back over narrow, winding, mountainous trails, or in rowboats on the numerous beautiful streams and lagoons. Freights are thus carried at enormous expense of both money and time. To the citizen of the United States these methods of locomotion are tedious in the extreme. A few weeks' travel in Honduras, away from the railroad and the great national highway, is the only manner in which one can be indelibly impressed with the crying need for modern methods of transportation in a country as beautiful and as rich in natural resources as any other on the earth.

With her untold mineral wealth, her incalculable values in hard woods and other timbers, her illimitable agricultural possibilities, her vast quantities of fish and game, her green hills and vales, her clear streams and her incomparable climate, give Honduras a proper net-work of steam and electric roads, put modern steamboats on her rivers, and no country anywhere will be more delightful for residence or more enticing as a place in which to

accumulate fortunes. She will then become the gem of the sub-tropics, where the life of the planter, the miner, the merchant will become the life of ease and affluence.

The Government of Honduras is administered wisely and economically. Her imports and exports now show a balance in her favor of more than three million dollars annually. That is, she is adding this amount to her wealth each year. Put in another way, her exports bring in 135 per cent. more than the cost of her imports. Any man whose business returns 135 per cent. on the purchase price of his goods would consider himself doing pretty well. So with a country. With this rate of gain continued, Honduras will soon become a very wealthy government. The rate of gain is constantly increasing!

The President, General Don Manuel Bonilla, is devoting his energies to the upbuilding of the agricultural, mineral and commercial relations of his country. He is surrounded by an able ministry. The Government invites foreign capital and energy and does all it can to aid in their prosperity. It treats its newcomers with the most profound consideration. The people are polite and obliging. They are honest in their dealings.

The Constitution of the Republic of Honduras guarantees the same liberties as to life, property and religion as does the Constitution of the United States, both to citizens and foreigners alike. The lives and properties of foreigners are as safe in Honduras as they are in our own country. In fact, the percentage of criminality in Honduras is much smaller than in North America. Thefts, burglaries, highway robberies and murders are extremely rare in Honduras. Only when a foreigner interferes in affairs political does he subject himself to risk of bodily harm, and even this risk is slight. The Hondureño, excited politically, does much shouting and little shooting. The U. S. newspaper accounts of political upheavals in Honduras are invariably grossly exaggerated. Such reports do Honduras a great injustice. They also injure Americans who have interests in that country, because when Hondureños read false reports in U. S. papers, they naturally feel resentful toward a people who will deliberately publish falsehoods detrimental to a law-abiding race. The worst element in Honduras comes from the U. S. Those who go there to engage in business have to be on their guard against persons of our own nationality. This fact is not intended to be disparaging as to Americans in general in Honduras. There are large numbers of honorable citizens from and of the U. S., who have become established in our sister Republic in planting, mining, merchandising, lumbering, shipping, etc. It is only the adventurers of whom we must beware.

The Hondureño attends strictly to his own business, so far as the foreigner is concerned. What if he have his political disputes? We have them at home. As to the likelihood of serious quarrels interfering with foreigners, we have only to point to the past. Since the formation of the Republic in 1821, we know of no instance in which foreign corporations or individuals have suffered more than delay during a political disturbance. Property rights have always been respected, and in case of accidental loss of property or goods, reparation has been prompt and ample. That no serious disturbance is likely to occur in future is exemplified by the recent scrap between Salvador and Guatemala, when Honduras took a hand only so far as was necessary to repel invaders from her territory. Within forty-eight hours after Presidents Roosevelt and Diaz spoke hostilities ceased. Our own Government will not permit anything approaching a revolution in future. And our own President made a wise move when he placed a certain future responsibility upon Mexico and gave her a proud feeling of increased power, by inviting her to join in the protest to the contending nations. The writer has made a close study of Honduras for many years. Has been over much of her territory, and has been through one of her so-called revolutions. After these experiences he can truthfully say that he never had occasion to fear anything or anybody in that country; that he felt safer there, sleeping under a shack without doors or walls, or in traveling in the wilds, night or day, than he does in any city of our own country sleeping with doors locked and windows barred or in walking our own streets at night. And this same feeling of security obtains as to property, whether it be merchandise, live stock, money or real estate. The Hondureño does *not* steal your money, rob you of your jewels, cheat you out of your property or murder you.





BANANAS ON PATUCA RIVER.

REPORT
OF THE
CHIEF ENGINEER
OF THE
AMERICAN-HONDURAS COMPANY.

TEGUCIGALPA, HON., C. A.

President and Directors,
AMERICAN-HONDURAS COMPANY.

Gentlemen:—

I have the honor to make the following report on the improvement of the mouth of the Patuca River, Hon., and the other works required in the concession from the Government of the State of Honduras to your Company.

In August I came to Honduras, and in this month and the two following with a surveying party, by your direction, I made a careful hydrographic survey of the Patuca Bar and the mouth of the river and a reconnaissance, boat survey and soundings of the river as far as Gualpitanti, 75 miles from the mouth, by the river, and in November I made a preliminary report of this survey to which attention is invited for a general description of the region embraced in the examination.

Having now completed the detailed plans required under the concession, and the same having been approved by the Honduran Government, I submit them together with this report on the feasibility and conduct of the work and physical characteristics of the river as developed by the survey.

IMPROVEMENT OF THE PATUCA RIVER MOUTH TO OBTAIN A DEPTH OF TWELVE FEET OF WATER ON THE BAR AT LOW TIDE.

The Patuca River, the longest river of Honduras, discharges into the Caribbean Sea on the north coast of that Republic 225 miles east of Puerto Cortez, the principal port of the State.

The nearest port of entry is Port Burchard, 58 miles to the westward, which is Yriona Post Office. A small village of 31 cabins of Mosquito, Zambo and Poya Indians is located at the mouth of the Patuca River, and the Government has established a Post Office and Custom House here.

The latitude of Station "M" in Patuca village, as determined by me, by 3 Meridian altitudes of the sun, with a Fauth Solar-transit, is N. $15^{\circ} 50' 34.9''$.

The longitude, taken from the Coast Chart No. 394, U. S. Hydrographic Office, U. S. N., is W. $84^{\circ} 17' 05''$.

The station is a stake N. 6° , 30 W. Mag., 30 ft. from the N. W. corner of Frank Fairweather's board house.

The magnetic declination at the same station on October 2d, I found from four observations of the sun, with a solar transit to be $4^{\circ} 30' E$.

The Patuca River is about 300 miles long. As far up as I examined it, I found it to be about 400 to 500 feet wide and with a 12 to 15 feet depth at the mean stage of water when I visited it.

I was unable to establish the low water depth, as the river did not fall to that stage while I was there, but from the best information that I could obtain it is about one to eight feet less.

RIVER GAUGING AND CURRENT OBSERVATIONS.

I gauged the river at Gualpitanti on September 24th, at which time the water was 6 feet above the low water line and about $2\frac{1}{2}$ feet below the mean. The depth was $12\frac{1}{2}$ to 17 feet and the mean velocity 5.62 feet per second or 3.83 miles per hour, and the discharge equalled 36,374 cubic feet per second.

DEPTH, ETC.

Twenty-four and one-half miles above the mouth of the Patuca, the river divides, the left hand branch, called Toom Toom Creek,

going to Brewer's Lagoon. Just above the head of this pass I found the width of the main river to be 390 feet and the depth 26 to 30 feet in the channel on September 28th, and approximate mean velocity 3.56 feet per second or 2.42 miles per hour, the river being about 6 feet above low water. The depth in the Pass or cut-off was from 21 to 48 feet at this stage, and the width from 165 to 200 feet. Just below the head of the Pass the main



THE PATUCA RIVER BY MOONLIGHT.

river was 300 feet wide and the depth from 21 to 26 feet in the channel. (See plan of head of Toom Toom Pass).

Complete data was obtained for computing the discharge of the Pass at a mean stage of water, but it has not yet been worked up. This is required in designing the proposed dam at this point, and also the low water plane and discharge must be established, which can only be done at the low water season.

HARBOR DEPTH.

The width of the river at the gorge at Patuca is 670 feet, and the depth, reduced to mean low water, is 23.4 feet in the channel, which is on the west side, to 13.5 in the middle of the river. Along the front of the village of Patuca the depth runs from 18.5 feet to 24.4 in the channel about 100 to 150 feet from shore. Just above the village the width narrows to 465 feet, with a depth of 22.5 in the channel.

VELOCITY.

The mean velocity at the gorge on September 2d and 3d was 2.57 feet per second or 1.75 miles per hour, and the discharge 24,552 cubic feet per second. In the channel near the west shore, the mean velocity was 2.85 feet per second. The flood never sets up in this river. Thirty-two floats were run through the gorge, of which 16 were run while the tide gauge showed flood and 16 on the ebb. The mean velocity on the flood and ebb was exactly the same. These floats consisted of maiden cane weighted with a piece of iron at the bottom and having a wooden block about 3 or 4 inches square attached to it at the water surface.

The canes were cut so as to clear the bottom 1 foot, the depth on the course having been previously ascertained in sounding the river. A tiny flag, with number, was attached to the top of each float rod, which projected about 1 foot above the water surface. The time chosen for running the floats was perfectly calm.

NO TIDE.

A base line 931.6 feet long was measured on shore and a transit instrument set up at either end and the exact time of the upper and lower transits taken through the instrument with a stop watch reading to one-fifth of a second. The exact course and time of each float was also located simultaneously some 6 to 8 times in each run by the instruments. The mean velocity was reduced from these observations, and is believed to be the mean vertical section velocity, very nearly. These observations show that at this stage of water there is absolutely no up current in the river, even at the bottom, the floats remaining nearly vertical in their passage.

I am informed by the Indian residents at Patuca that the current *never* sets up in the river. On May 5, 1898, Mr. John E. Wood made a single current observation by noting the time required for a piece of scantling 3" x 4" x 6 feet to pass from the

upper end of the town to opposite the point of the gorge, which resulted in a velocity of 0.90 feet per second or 0.61 mile per hour. The stick was weighted at one end so as to float upright in the water. This observation was made at the season of extreme low water in the river. At that time, according to Mr. Wood's survey, a dry sand bank projected into the river at the gorge from the west side, as shown on my chart of the harbor in dotted lines, 220 feet, where at the time of my survey we found 23.4 feet of water. Another point projected from the west shore into the harbor 440 feet, near where I have located the west jetty. Mr. Wood's survey and map was so crude and imperfect that no dependence can be placed on it. It is probable that the bank shown by Mr. Wood at the gorge point really occupied a position to the north of the point, where our survey developed a shallow with $3\frac{1}{2}$ to 5.7 feet of water.

OFF SHORE CURRENTS.

Owing to the want of suitable boats for outside work no satisfactory results could be obtained in observations of the littoral currents. The Indian canoes, which were the only kind of boat available, proved totally inadequate and were repeatedly swamped while crossing the bar, the sounding clocks were filled with water and ruined and the note books soaked until they fell in pieces. By great good fortune no lives were lost and the note books were saved, otherwise all the work of the survey would have had to be gone over again. On account of the utter worthlessness of these canoes for such work we were obliged to omit taking a great many outside soundings that should have been taken.

The result was that being unable to do any work with a sextant in these canoes, owing to their smallness and unsteadiness, both myself and my assistants were obliged to remain on shore, and the only recorders available to go in these Indian dug-outs proved incompetent to read time, confusing the notes to such an extent that it proved almost impossible to plot them, which could only be done after long study and by devoting not less than 4 times the time to the work, than would otherwise have been required. We would never have been able to accomplish anything if the sea had not been exceptionally smooth at that time.

The few current observations taken are shown on the chart of the harbor. The flood currents off Patuca point are found to run to the west and northwest. Off the east beach 3 of our surface floats, on the first quarter of the flood, came directly in to the beach with a velocity of 0.34 miles per hour. One of them was caught just inside the line of breakers in the surf race and carried

up the beach in the direction of East Point with a velocity of 1.04 miles per hour. This current continues clear up to the point. The current setting in to the beach here seems to be essentially a surface current until shoal water is reached near the beach, for of the two sub-surface floats set out at the same time, one only travelled 460 feet in 1 hour and 21 minutes or 0.06 miles per hour, in about the same direction as the surface float which travelled about 6 times faster. The other bottom float developed the same velocity.

One surface float put overboard in 6 fathoms of water started in a course of about S. 8° W. and curved round toward the west until its course was S. 65° W., velocity, $\frac{1}{2}$ -mile per hour, on first quarter of flood. This shows a circular action or large whirlpool in connection with the currents up to the east beach and those crossing the bar, the center of which appears to be the deep hole marked "Hard" with over 24.5 feet, $\frac{3}{4}$ of a mile east of east jetty.

Off the bar, at the main channel entrance the first quarter of the surface ebb runs to the N. E. while the fourth quarter runs east, and in the east swash channel the first quarter surface ebb also runs east. In the same place the bottom float, on the last quarter of the ebb, September 8th, was found to have a velocity of 1.11 miles per hour, or 1.63 feet per second, on a course N. 54° 45' E., which gradually decreased as the distance from the bar increased, until at a distance of 2,900 feet the velocity was only 0.41 of a mile per hour. The surface and bottom velocities show a divergence, therefore, of 39 degrees. The surface velocity was so great that the surface float put overboard at the same time was carried so far out to sea in 30 minutes that it was lost sight of and never recovered. It was perfectly calm while these observations were taken.

The surface float was an egg-shaped block of Balsa or Maguey wood, fully as light as cork and carrying a very small flag with a number. The bottom float was a galvanized iron can 2 feet long by 10 inches in diameter, filled with water and connected with a small perch fish line with a surface float, such as just described and which sustained it, the line being made of such a length as to float the can 2 feet above the bottom.

These observations failed to establish the fact of any littoral current on the bottom, but would seem to indicate the existence during flood tide of a surface current setting along the beach to the west on both sides of the river. It is much to be regretted that the facilities at my disposal prevented a more thorough ex-

amination in this direction, as the establishment of the fact of the existence of a strong littoral current would dispose effectually of the question of jetty extension.

CURRENT ACTION.

According to Du Buat, a velocity of 0.44 mile per hour will lift sand as coarse as linseed, and 1.50 moves pebbles an inch in diameter. The bottom velocity, 2,900 feet from the bar, in a depth of 4 fathoms, as proven by our observations, is 0.41, and at the gorge we have a mean velocity of 1.75 miles per hour, or 2.57 feet per second. In Ex. Doc. 78, 48th Congress, it is stated that "the mean ordinary velocity at the narrows in New York Bay is, during the ebb tide, about 2 feet per second and from this a depth of 100 feet results."

We may expect nearly the same velocity as the latter, at the bar, when the jetties are completed and the current is confined between them. While these experiments of Du Buat were made on a small scale and are not conclusive, there appears to be good reason to believe that the velocity in the jetty channel will be amply sufficient to scour out and carry over half a mile out to sea, the sand, of which the bar is composed, even at the low water season.

The Patuca River is a sediment bearing stream, its ratio of sediment being 1-420 by weight, which is large. The observations for sediment were made at a mean stage of the river at Patuca, and are a mean of 30 observations, half of which were taken at the surface and half 1 foot above the bottom. The mean of the surface observation was .002250442 and of the bottom .002522168.

The following table gives the ratio of sediment in some other rivers:

Name of River.	Volume.	Weight.
Mississippi	1/3000	1/1523
Irawaddy flood.....		1/1700
Irawaddy, low.....		1/5725
Rhine, flood.....	1/100	1/51
Rhine, low.....	1/200	1/20734
Yellow of China.....	1/200	1/102
Po (Italy).....	1/100	1/51
Danube (Austria) low.....		1/1609
Danube (Austria) flood.....		1/817
Mersey, tidal flood.....	1/1414	
Mersey, tidal ebb.....	1/728	
Average of all rivers, according to Manfredi..	1/175	1/89

The sounding lead disclosed several patches of mud deposited on the ocean floor. (See Chart of Patuca River mouth). These extend from just outside the bar to the 4-fathom line, and a short distance beyond, and mostly lay in the bight formed by the bar and the east shore line. Their location there may be owing to the fact, as mentioned in my preliminary report, that the river formerly discharged into this bight. There is also one deposit in the middle of the harbor in a depth of 10 feet of water.

SEDIMENT.

These deposits are not extensive enough to occasion any apprehension from that source in the future, although the sediment brought down by the river amounts to the respectable sum of 68,281,243 cubic yards per annum, sufficient to cover an area of 22 square miles 3 feet deep. A large part of it is of so fine and flocculent a nature, that it is carried many miles away and dispersed in the sea. This is proved by the fact that the off-shore contours at the mouth of the river do not present any abnormal curves, as they would do if the material brought down by the river were all dropped on the ocean floor in front of the bar, which would result in forcing the curves out to sea over a fan-shaped area in front of the mouth, owing to the deposit of material. On the contrary, the curves are perfectly regular and parallel to the shore.

SURVEY.

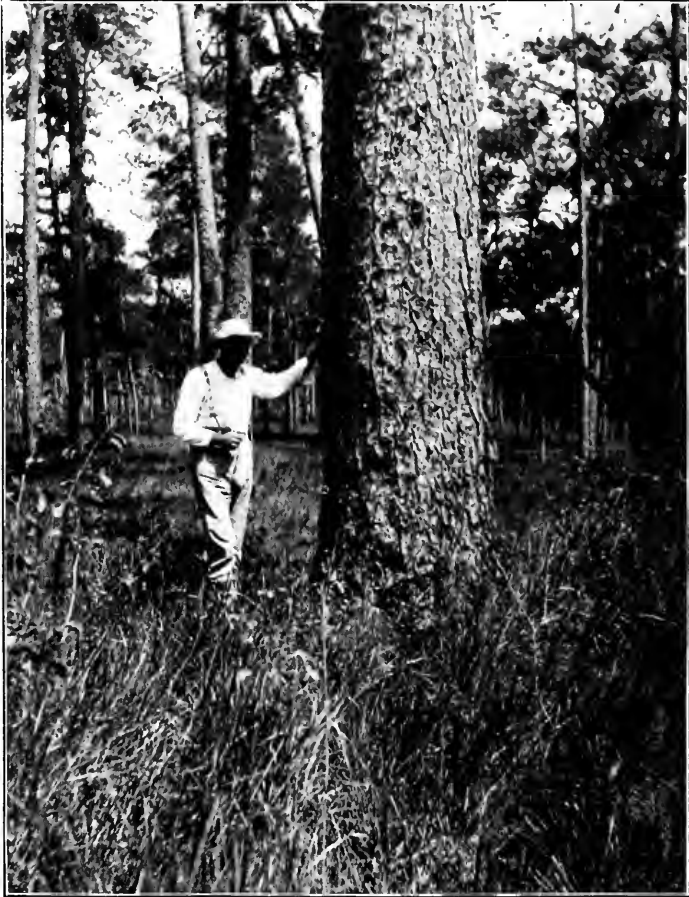
The survey of the harbor was commenced on August 19th and completed September 12th, including latitude and magnetic observations. Twenty-nine and one-half miles of soundings were run, 21 triangular stations established and marked with iron bolts and all angles repeated (5) five times on each vernier, and means taken, all angles being checked by computation of triangles.

All soundings were taken on time signals and every fifth cast of the lead was signalled by a flag and was located by intersecting angles from two transits on shore. The soundings were carried out 1.75 miles from shore in order to develop the littoral contours and discover any coral or other ledges that might exist, and the character of the bottom, as shown by the lead, was noted and is shown on the accompanying chart of the river mouth. All soundings not otherwise specified are sand bottom.

A minute topographical survey was taken of the shore, and levels of the ground taken at several places in the village, above mean high water and shown on the map in red figures.

TIDE.

Four tide gauges were set up and connected by a line of accurate levels and also referred to permanent bench marks. The tides were observed through one lunation and found to have an



PINE TREE ON BANK OF PATUCA RIVER.

interval, between high and low water, of 5 hours and 48 minutes, with a mean rise of 10 inches and an extreme of 1.50 feet.

The tidal curves are much influenced by the wind and the state of the sea outside and are very irregular and the observations

should be extended over at least 12 months to establish accurately the mean ordinates of the ascending and descending nodes.

The force and directions of the currents were noted at 16 places on the bar, and outside, and 3 cross sections were measured at the gorge and 34 float-runs made, with 231 instrumental observations for course and velocity with sub-surface floats.

Repeated observations were made at Station M, Patuca village, for latitude, longitude, time and magnetic declination, and also at the head of the Pass (Toom Toom Creek), at Cropunto and Qualpitanti, at the three last places with a sextant and at Patuca with a solar transit.

RIVER REGIMEN AT THE MOUTH.

WIDTH OF RIVER.

BAR.

The width of the mouth of the river is 3,750 feet, or over $\frac{3}{4}$ of a mile, while the width of the gorge is 670 feet. The crest of the bar is a semi-circle and measures 7,000 feet, or over $1\frac{1}{4}$ miles, and encloses a sector of 180° on a radius of about 2,500 feet. The river is now discharging over this crest a sheet of water about 1 foot in depth, except in the main channel, where for a width of about $\frac{1}{4}$ of a mile the depth varies from 3 feet at the edges to 5.5 feet in the center at low water. The width of the west swash channel is about 270 feet and the depth 2.6 feet. The east swash channel is about 600 feet wide and 3 feet deep. There are also two other small channels as shown on the chart.

SAND MOVEMENT.

The bar is composed of coarse sand and at one point is above water at ordinary high tide. The race along the east beach is constantly bringing sand from the eastward and building out the east point, which in the last 8 years has been extended in this manner, 400 feet, if we may credit the statements of the Indians and others who have been familiar with the locality for many years. The prevailing winds here are from the east and south-east, and the waves strike the beach to the eastward of the river mouth at an angle of about 45° and less, and so every wave moves its quota of sand to the west. This is easily proved by observation. Wading into the surf here, as I did, the sand is

seen rapidly moving along the bottom towards East Point, with a measured velocity of about 1 mile per hour. This is especially noticeable in the afternoon, when the wind almost invariably blows briskly from the eastward. In the night the wind is generally off shore and in the early morning and during the first half of the forenoon it is almost always calm.

OBJECT OF JETTIES.

The bar, as shown on chart, forms a semicircular rim, enclosing the harbor basin with the water running over the rim, and deeper in some places than others. This rim, or wier, measures something more than 10 times the width of the river at the gorge and the result is a diminution of the velocity at the bar, from 2.57 feet per second mean velocity to a bottom velocity of about 1.63, or about 20 per cent. less, in the swiftest current of the main channel, and of course less at other places on the bar. The object of the contraction works on the bar is to increase the velocity up to that which obtains in the gorge and so cause the same quantity of water, which now spreads out over a sector of 7,000 feet, with a greatly retarded velocity, owing to friction on the bottom, to be so confined that it will be forced to cut for itself a channel with a cross section similar to that at the gorge.

WORKS PROPOSED.

To accomplish this result it is proposed to construct two jetties with a total length of 5,040 feet, converging from the shore to the 9 foot outside contour, where they will be 700 feet apart and the direction of the resulting channel will be N. $30^{\circ} 45'$ E.

EAST JETTY.

The concession from the Government of Honduras requires a channel sufficient to admit steamers drawing eleven feet at low water. The present channel is 5.5 feet deep at low water and I have located the jetties, one on each side of this channel, which has the same course as the proposed jetty channel. The east jetty will start from east point and run N. $1^{\circ} 30'$ W. (true) along the inside of the crest of the bar for a distance of 2,230 feet to a point of curvature, thence on a 4° curve to the eastward, radius 1,432.69 feet, 690 feet more, to the 9-foot contour outside, on the southern edge of the present main

channel, the total length being 2,920 feet, of which 50 feet is built on the shore of east point. This jetty will be built in a depth of water ranging from 9 feet at low water, at the end, to 3 feet in the swash channel close to the point and varying along its length from 6 feet to a little less than 3 feet, according to the depths that obtained at the time of the survey. Except at the outer end, it will lie entirely inside of the line of breakers, which will expend their force on the protecting sand bar outside.

The foreshore of protecting bar will average 300 feet in width, on which there will not be over $4\frac{1}{2}$ feet of water at extreme high tide.

PROTECTION OF JETTY.

From the fact of the continuous deposits of sand now building out East Point, and the "Law of the Deposits of the Flood Tide," demonstrated by the late Rear Admiral Davis, and published in the Smithsonian contributions to knowledge, and from the fact of the construction cutting off the currents that now sweep around the point and across the crest of the bar, it will be seen that in the proposed location we will be assisting nature to build up the littoral cordon and prolong the east point, and it is believed that the forces of nature, thus aided, will, in a comparatively short time, cover the jetty for $\frac{1}{2}$ or $\frac{2}{3}$ of its length with a wide protecting deposit of sand brought from the east beach, thus insuring the permanency of the work, and that eventually the bight to the eastward of the jetty will fill up, extending the foreshore several hundred feet. This has always been my experience with many similar works that I have built, under like conditions. The sand covering will protect the work from the sea worms, if any exist here.

SEA WORMS.

I do not, however, anticipate any trouble from worms, as at all times except the season of dry weather, which lasts but one or two months, there is no salt water in the harbor. The amount of discharge and strength of the current of the river is such that no salt water can force an entrance. I found the water potable $\frac{1}{2}$ mile out to sea, and the boatmen employed in sounding dipped the water up in their calabashes from over the side of the boat and drank it in all parts of the harbor and outside the bar. It is well known that fresh water kills the sea worms. During the dry season the water in the harbor

is brackish for one or two months. If the worms should attack the piles then, they would be killed immediately by the return of the fresh water. When these sea worms begin their attack on wood, they are very minute in size, not larger than the point of a pin, and the holes they make in the wood are inconsequential, and it is believed that the returning fresh water will kill them before they can do any damage. In order to be on the safe side, however, it is proposed to use Botan, Quassia, Palmetto, Ebo or Quiebrahacha, Fustic or Guaiacan, which are said to be practically immune from them, or to treat the wood with Carbolineum Avenarium.

The jetty will be built by driving two parallel rows of piles 2 feet apart from center to center in the rows, and capped with cross caps at mean low water of 8" x 8" hard pine, every 4th pile, making the bays 8 feet long.

MODE OF CONSTRUCTION.

On these caps are bolted and strapped longitudinal stringers of hard pine 8" x 8", as shown on plans. The distance between the outside rows will vary, commencing with 2 feet on the shore, which widens to 4 feet at the low water mark and so continues widening by 2 feet at a time as the depth increases or the exposure becomes more, until the last section is reached at the outer end, the width of which is 18 feet. When the width reaches 14 feet, a middle line of string pieces is introduced, as shown on plan, and more piles are placed under the cross caps in the outer end section. The space between the outer rows of piles is filled with Bamboo logs, of which there is an inexhaustible supply up the river, up to mean low water, and these are capped with 2 feet of rip-rap rock, which brings the top of the rock about 8" above extreme high water. From the shore end out to a width of 14 feet the bottom layers of Bamboo logs will be laid transversely and projecting 6 to 8 feet alternately from the side of the jetty, to serve as an apron and sand catcher. The rest of the logs will be laid longitudinally and inclined as shown on plans, in order that they may bind better. Every Bamboo log will have, when laid, a hole cut in the top of the middle of each two joints, about an inch in diameter, for the purpose of admitting water and sand.

Anyone who has walked a sandy sea beach cannot fail to have noticed that every barrel, box or other receptacle that had a hole in it, was filled up to the water level with sand, and it is also noticeable in all wrecks, so it has come to be an axiom that sand will go wherever water will. It is believed that the

constant action of the waves, washing the sand around and over the jetty, will shortly fill with sand all these hollow bamboo logs, making virtually a protected sand jetty. These bamboo logs will then resemble the loaded facines of grundswellen which are so largely used in dykes and submerged dams in the improvements of rivers in Germany.

CEMENTED BAMBOO LOGS.

It is probable also that the logs and rock will soon be covered with shell fish, such as oysters, muscles, clams, univalves, sea snails, and small conchs, which will cement the whole firmly together. This has always been my experience on other works.

The bamboo contains a very large proportion of silica, and these logs being always under water, will never decay. Up the river I noticed bamboo logs projecting from the bank some 4 to 6 feet below the top of the ground and a couple of feet above the water at that time. The bank was composed of river alluvium which had been deposited so many years ago that trees 18 to 20 inches in diameter had grown upon it, thus showing the lasting character of the bamboo wood. From the 14-foot width to sea end of jetty, the bamboo logs are laid in alternate layers transverse, and longitudinal, so as to give side slopes of 1 to 3 feet, as shown on plan (Sheet 5), the slopes and top being covered with 2 feet of rip-rap rock and the extreme sea end having the same slope and being protected with the same amount of rock, held in place by two rows of piles driven on the same slope and projecting 1 foot above the rock, these piles to be driven below low water by means of a follower and forming a *cheval de frise*.

WATER JET PILE DRIVING.

All the piles in the jetties will be driven by means of a water jet, which method is peculiarly well adapted to this work. The pile driver will be mounted and rolled along on the longitudinal stringers and so made and counterweighted with the engine and boiler as to overhang 8 feet in front, to allow the bents to be driven 8 feet in advance of each other. The bar, on which the jetties are located, is composed of sand built up on the floor of the ocean by the combined opposing forces of the river and sea. The piles should be driven butt end down to oppose more resistance to being pulled up by the waves. This is perfectly feasible with the water jet.

The west jetty will be built in the same manner as the east jetty and of the same materials. The shore end will be located 725 feet south of Patuca Point, as it was when the survey was made, and will run straight N. $55^{\circ} 45'$ E. (true), 2,120 feet to the 9-foot, outside contour. The shore end of the jetty will be 2 feet wide and 50 feet long, built in the beach, same as the other, and the sea end 18 feet wide. The depth of water in which this jetty will be built will average about 5 feet at low



PART OF THE FORCE AT THE PLANTATION.

water, and it will be protected, except at the sea end, by the sand bank and bar on the north, the foreshore being from 1,000 to 1,700 feet, on which there is not over $4\frac{1}{2}$ feet of water at extreme high tide, so the waves will break on the outer bar and expend their force long before they reach the work. Part of this foreshore is now above ordinary high tide and it is believed that the action of the waves will pile up the sand so

as to make a dry beach from Patuca Point to near the end of the jetty, when the outflowing currents are cut off by the works. Indeed it was reported to me by some of the American residents there, that at times past a dry sand spit had extended from Patuca Point to the "Sand Bank" shown on the chart, and Mr. Wood's survey shows a sand bank making out, at low water, in the same direction, showing an evident attempt on the part of nature, to close the west swash and little channels, which our jetty as I have located it, will assist.

These river bars on a sandy coast are always changeable until nature is assisted. There is a constant warfare going on between the forces of the river and those of the waves and littoral currents, the latter unceasingly endeavoring to build up and preserve the littoral cordon and the former endeavoring to break through it.

It is only when the currents are guided and the conflicting forces harmonized by properly constructed works, that the regimen of the river is preserved and stability insured.

GALVESTON JETTIES.

The success of properly constructed jetties in making and maintaining navigable channels in such cases is now too well known and established all along the coasts of the United States and in numerous foreign localities to need mention here. I might, however, mention Galveston, Tex. In 1893 the channel across the bar was but 13 feet deep. In 1897 it was 24 feet, and 1899 26 feet, the effect of the construction of converging jetties. In 1894 but \$2,500 worth of corn passed through the port. In 1898 there were shipped 5,400,000 bushels. In 1895 there was no wheat. In 1898 the shipments of wheat alone amounted to 11,200,000 bushels. Before 1896, the total value of all exports never exceeded \$36,000,000 per annum. In 1898 they were \$77,000,000. In 1881, I laid out the jetties at the mouth of the St. John's River, Florida, and was in charge of their construction for the United States Government, where there was but 12 feet of water on the bar. In 1888 there was 21 feet, and this result might have been achieved in two years had it not been for the dilatory and wasteful action of the Government in doling out the appropriations.

In 1889 I laid out the jetties at the mouth of the San Juan River in Nicaragua, the eastern end of the Nicaragua Canal, turning the river current across a dry sand bank 3 feet high above ordinary high water, and in 9 months afterwards schooners drawing 14 feet passed through the new channel into the harbor.

In 1882 I was in charge as engineer of the construction of jetties for the United States Government at Valusia Bar, Lake George, and later had a contract for their completion. Here the water was deepened from $4\frac{1}{2}$ feet to 6 feet, all that the class of boats using the lake required.

OTHER SUCCESSFUL JETTIES.

Similar good results have been obtained at Newburyport, Charleston, Savannah, Aransas Pass, Texas, Brazos and Sabine Rivers, the Mississippi, the Columbia, the Danube, the Schwine-münde Haff, and would have been at Cumberland Sound, where I laid out jetties in 1882, had not the funds been misappropriated.

In fact I do not know of a single case where jetties, scientifically located and properly built, have failed in their mission. The success of the Mississippi jetties and the phenomenal growth of the shipping business of New Orleans, immediately after, is well known to every one.

The planning and location of jetties is very important. The shortest and most direct line from the gorge to deep water outside must always be chosen, consistent with the following requirements, and the new jetty channel should be so located as to debouch in the sea, where the steepest contour is found for several reasons among which are:

1st. Steep contours generally are caused by a littoral current, which is very desirable, as it will sweep away the sediment brought down by the river and effectually dispose of the question of bar advance.

2d. The location marked by steep contours, even if no littoral current exists, will render the necessity of jetty extension less probable. Jetties should never debouch into a bight, but should always be carried out to the point of the salient angle.

They should always be so located as to assist nature in forming the most natural channel and in building up the spits or natural moles that nature is attempting, as shown by comparative surveys, extended if possible over a period of several years. For this purpose a critical comparison of all former charts of the locality should be made.

Jetties should always be located as nearly parallel as possible, because converging jetties that approach each other at a large angle, produce counter currents and whirls that not only make the bottom very lumpy, but also endanger the stability of their own foundations and encourage the formation of a new bar outside their mouth. In such cases it is better to make right angled off-

sets in the jetty, if they cannot be planned with suitable curves, so as to project the trace over the bar, as nearly parallel as possible.

DIRECTION OF JETTIES.

It is also desirable to so plan the jetties that the channel shall not face the prevailing winds or at all events the direction from which come the heavy storms, in order to preserve tranquility in the harbor and prevent the washing in of sand during severe storms, and also to facilitate sailing vessels passing in and out, which they cannot do in a narrow channel except on a beam or leading wind.

When converging jetties are located approaching each other at too large an angle, they have a tendency, like a dam, to raise the water and so lessen the hydraulic grade from the gorge to the contraction in the jetties and this tends to a deposit in the fairway above the contraction, especially during the construction of the works and before the jetty channel has obtained its normal regimen or depth. It is often necessary to drag the fairway with heavy looped chains from a tug-boat, or to stir up the bottom with a water jet, and allow the current to sweep the deposits away. It is often found to be efficacious to weight the tug-boat at the stern and back up the channel with the screw revolving as close to the bottom as possible.

DREDGING.

After the works are completed and the proper depth corresponding to the velocity and discharge has been established across a bar from deep water inside to corresponding deep water outside, the hydraulic grade is rendered more nearly uniform and the tendency to a diminution of the velocity and consequent deposition of suspended sediment has ceased and no more trouble need be apprehended. In our case the distance between the 12-foot contours is 2,180 feet, with a cut on the crest of the bar of 6.5 feet to give the required depth of 12 feet at low water, and requiring the removal of 90,537 cubic yards of sand and mud for a 300-foot channel, to which it is proper to add 20 per cent. for wash from the sides, making a total of 108,644 cubic yards. It is believed that much the largest part of this material will be swept out to sea upon the completion of the contraction works, and an expenditure of about \$1,000 in dragging the channel will suffice to clear out the rest.

In laying out the jetties it is of the greatest importance to

proportion the distance between them correctly. This is a matter of mathematical computation by well established formulæ, which are given in the appendix.

If the jetties are placed too close together the hydraulic grade line is raised, owing to the inability of the water to escape promptly, and deposits are likely to occur in the fairway as previously explained. The stability of the works is also endangered by the excessive scour created, which may undermine them.

DISTANCE APART.

On the other hand, if the jetties are too far apart, the current will be too feeble, for want of concentration, and will be unable to keep the channel clear. It is better, however, to have them too far apart, rather than too close together, because if too close together, they are liable to ruin, but if too far apart, the matter can be easily remedied, as was done at the Mississippi by building groynes or perpendicular piers on each side, which will contract the available water way and cause the necessary scour to take place. These groynes can also be used if current should impinge against a part of the work and threaten to undermine it, or if groynes should be objectionable on account of contracting the water way too much, apron mattresses can be used, made of logs and paptas or other brush (see plan) and sunk to the bottom along side the jetty, by throwing on stone. This mattress will lay on the bottom and prevent further scour.

On account of the danger of scour and undermining, it is sometimes best to locate the jetty in deep water, although at very greatly increased cost, because if built on top of a high bank or shallow the changed conditions when a deep channel is formed alongside of it leaves it without foundations.

This can be remedied, however, if closely watched, by sinking protecting apron mattresses alongside the work before the scour has done any damage, and this is very much more economical and is better practice.

PRECAUTIONS.

The matter of the utmost importance, however, in all subaqueous works, is to watch it assiduously every day and test the depths carefully with the lead line or pole, and on the first intimation of giving way or undue scour, to rush forward the reserve mattresses instantaneously, otherwise it may easily cost \$10,000 to repair the damages done in 48 hours. Of equal importance

is it not to commence any jetty construction until all the funds, material and appliances required to complete them are on hand and instantly available, because if work of this character is left in an unfinished and unprotected state, it is exposed to destruction in the first heavy storm. Moreover, while construction is going on the regimen of the river is unsettled, new currents are created with changeable courses and varying power. New channels are apt to form around the exposed ends of the work, or to break through and destroy if unfinished. We may thus find an entirely different problem presented when work is resumed, requiring an entire modification of the treatment. The sand may be so washed away in front of our work, or pot holes may be found, as to require 500 times as much more material per 100 feet section than before. I have known the bottom to be cut away from the side of an unfinished jetty from 18 to 50 feet in two weeks, requiring a year to repair the damages. And this has been the customary history with harbor works in the United States because of the niggardness of Congress in granting appropriations and the long waits for money. This is now happily remedied by the Congress in later years making continuing appropriations at first for the completion of the work. For these reasons the immense cost of River and Harbor Works in the United States is proverbial, and works have necessarily been made far more massive than would otherwise have been necessary, in order that they might be saved from destruction in the periods of suspended work.

PRACTICABILITY.

In concluding this part of my report, I will repeat what I stated in my first report; *i. e.*, the improvement of this bar to obtain a depth of 12 feet and even more is entirely practical and easy of accomplishment. It is probable that if the works are carried out as planned, that a depth of 18 to 20 feet will be obtained through the crest of the bar, but some dredging may be necessary to obtain this depth in the middle of the harbor.

FAVORABLE CONDITIONS.

In fact, all the conditions are favorable to success here. The Caribbean Sea is generally placid and hurricanes are almost unknown. There is almost an entire absence of ground swell. The Northerners that blow in the winter three or four times for a period of three or four days each, have expended most of their



STEAMER "MAID OF PATUCA."

force in the Gulf of Mexico, and by the time they have reached the North coast of Honduras, have nearly died out. The sea here is practically tideless, with only an outflowing current from the harbor, and consequently no complication of currents and deposits caused by flood tides. These conditions are the most favorable, *i. e.*, where rivers debouch into practically tideless seas, such as the Danube, the Mississippi and the jetties at Tampico, Mexico; the Brazos River, Aransas Pass and Galveston, Texas, and others. The configuration of the bar here is such that the jetties can be located behind protecting moles of sand, thus allowing the smallest dimensions to be used, and the fact that the tide does not rise high to cover these banks renders them a perfect protection to the works inside. There being no inflowing current, the water in the harbor is fresh for 10 months in the year, and consequently the danger from sea worms is reduced to a minimum. Plenty of timber abounds on the river banks, and suitable rock in abundance can be easily obtained in Brewer's Lagoon 28 miles to the westward. There is no ice, with its immense lifting power, to draw up the piles and destroy the work. Labor is very cheap and abundant, and the climate is healthy. Food is cheap and fish and game abound. The bamboo grows in the greatest luxuriance up the river, as well as the long-leaved pine and innumerable other first-class woods. The advantages of the use of the bamboo in the jetties in the manner I have described are the following:

HEAVY.

1st. When filled with wet sand it is much heavier than solid wood, pine logs, for instance, weighing 65 lbs. per cubic foot, and rip-rap gneiss rock from 96 to 100 lbs. when loosely piled, as it would be when thrown on the jetty, while wet sand weighs 118 to 129 lbs.

2nd.—Sand, when confined, makes the most solid and durable of foundations.

3rd.—Bamboo logs are very light, easily cut and handled and under water are practically imperishable.

4th.—They can be procured for about 10c. a piece as against 50c. for other logs.

JETTY EXTENSION.

This question can only be definitely settled by investigation of the facts regarding the existence or non-existence of littoral currents off the mouth of the proposed channel.

I do not, however, anticipate any trouble from this score for

the next 25 years at least, if the jetties are built as now planned and located, on account of the fact, as shown by the off shore hydrography delineated by my survey, that the contours do not indicate any area of deposit outside the bar, but on the contrary they exhibit regular curves, without swelling. In the first days of jetty construction on the coast of the United States pessimistic prophets were not wanting who predicted the utter and speedy failure of all jettying of sediment bearing river mouths from deposits brought down by them and deposited in front. It was predicted that the Mississippi jetties would have to be extended several miles in less than 25 years. They have now been in operation nearly 30 years and no extension whatever has been required.

None of these alarming prophecies have been fulfilled in other cases. The "Law of Deposit of the Flood Tide," previously referred to, shows that everything movable thrown into the sea is taken up and deposited on the beaches. In our case the courses of the floats seem to show the existence of a circular movement to the east of the bar, the outflowing current sweeping round to the east and south and back again up the beach to the bar (see Chart of River Mouth) depositing its material along the beach and in the extension of East Point. It is possible, that the growth of this point along the East Jetty may necessitate the extension of the same a few hundred feet, after the re-entrant angle of the beach is filled up to near the chord from the end of the jetty to near Sta. 8, or a little beyond, but this will be a matter of several years, in all probability. But new conditions will arise upon the completion of the jetties, so that it is impossible to predict with certainty, until the action of the completed work can be watched for some six or twelve months.

ORDER OF OPERATIONS.

The work on the bar should be commenced at the close of the period of the northers, and be pushed with the greatest possible rapidity.

SAFEGUARDS.

All the material should be on hand and all the lumber cut ready for use before beginning work, as delay after work has commenced entails greatly increased cost and is sometimes well nigh fatal to success. Construction should be commenced on the beach, on the East jetty, by driving the piling and cap-

ping it, afterwards putting in the log filling and topping with rip-rap. When 800 feet of the East Jetty has been completed, construction should be commenced on the West Jetty and thereafter both should be carried on simultaneously to the end, two separate crews and pile drivers being employed. I consider this of the first importance. Indeed, upon it hinges the success of the work. By this method the currents are gradually concentrated towards the final channel and the scour initiated in the right direction. Indeed, by this procedure it is quite possible and I may say probable, that 12 feet will be obtained in the channel some time before the 9-foot contour is reached, thus affording a large saving in the length of the most exposed and costly part of the work, obtaining the results hoped for much sooner and allowing us to end the jetties in a more protected situation behind the bar, where the stability of the heads is more assured. On the other hand, if through false economy, only one pile driver is furnished, and one jetty has to be built first, new currents and forces are created and nearly double the quantity of water is forced across the site of the other jetty, eroding the bottom into gullies and holes, to fill which will augment the cost immensely and retard the completion of the work. Working on one jetty alone, we may easily go too far, as we discover later, when building the other, with the result that the resulting channel will have an entirely different course from that originally planned, thus complicating the question of jetty extension and perhaps leaving the harbor open to the heavy swells. On the other hand we may stop our jetty too soon, to take up work on the other and find when we return to it, that it is dangerously undermined and the contours may be so radically changed as to require a relocation.

ESTIMATE OF COST OF JETTIES.

In making these estimates I have used rock-bottom prices, which may appear too low for some, but they are prices at which, I know from personal experience, the materials in question can be furnished. In 1885, when I had the contract with the U. S. Government to build the Valusia Bar jetties, I bought yellow pine logs for piles 30 feet long, 15 inches diameter in the middle, pointed at one end and squared at the other, rafted down to the jetty, for 50 cents a piece and labor is \$1.00 per day in Florida, against \$12.00 per month in Honduras, but the former is better labor, although not enough better to make up the difference.

I have estimated lumber at \$6.00 per M board measure. That is the average cost of making the same class of lumber in Florida. Men who have been in the business in Honduras tell me it can be made here for \$5.00. To purchase it in Pensacola would cost \$12.00 per M with \$5.00 more for charter party and \$2.50 per M for loading and same for unloading besides cost of insurance.

Regarding bamboo logs:—being hollow they are easily cut and handled. In 1880 I was offered Cabbage Palmetto logs for the jetties of the Haulover Canal, Florida, of which I was the engineer, at 10c. a piece, in 10-foot lengths, which would weigh more and be harder to handle, as they would not float, than bamboo, which are very buoyant, the interior being perfectly hollow, and filled only with air, without any pith. I have estimated carefully the time and labor required in cutting and rafting them down the river at Patuca and believe that the cost will not exceed 10 cents each.

As to rip rap rock, in 1881 to 1884, when I was the Government Engineer in charge of the construction of jetties at Fort Clinch, Florida, and at St. John's river, Florida, and at Cumberland Sound, Ga., gneiss and granite rock was purchased by the contractor in New York and New London, Conn., for \$1.00 to \$1.25 per cubic yard, delivered on the ships rail at Fernandina or Mayport and I have no doubt but that my estimate of 55c. at Patuca, for rock from Cannon Island, in Brewer's Lagoon, where it is abundant and easy of access, will be found ample. I have estimated the iron at New York prices, and added a separate lump item for freight.

The cost of driving and capping is the customary charge for that work, as is the 25 per cent. charge for labor, which includes towing.

These estimates are based on the supposition that the works are built according to the plans presented and all material is supplied in advance of construction and sufficient money provided to carry the work through, when once begun, without stoppage and that no accidents, destructive storms or strikes occur, necessitating repairs or protection, and that the plan of operations is pursued as herein outlined.

COST OF EAST JETTY.

3,069 piles at 50c. (average 22 feet long.....)	\$1,534.50
82 M ft. lumber at \$6.00.....	492.00
12,690 lbs. straps (3" x 40" x 1/4") at .0225.....	285.52
18,333 lbs. 1 1/4 square drift bolts at .0025.....	412.49

8729 lbs. 6" spikes at .025.....	218.22
3445 cubic yards rip rap rock at 55c.....	1,894.75
22,000 bamboo logs (average 50 ft. long at 10c.....	2,200.00
25 cubic yards earthwork (trench) at 50c.....	12.50
1 day beacon.....	5.00
2 barrels pitch at \$2.00.....	4.00

Cost of East Jetty material.....	\$7,058.98
Driving, capping and stringing 3,069 piles at \$3.00....	9,207.00
Labor 25% of cost of material.....	1,764.25

\$18,030.73

Superintendence and engineering, 10%.....	1,803.07
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Total cost of East Jetty.....	\$19,833.80
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COST OF WEST JETTY.

2,221 piles average 22 ft. long) at 50c.....	\$1,110.50
50 ft. lumber 8" x 8") at \$6.00.....	300.00
8,407 lbs. straps (1/4" x 3" x 40") at .0225.....	189.16
11,477 lbs. 1 1/4" drift bolts at .0225.....	258.23
5,845 lbs. 6" spikes at .025.....	146.15
1,983 8 cu. yds. rip rap rock at 55c.....	1,091.09
16,000 bamboo logs (average 50 ft. long) at 10c....	1,600.00
25 cu. yards earthwork (trench) at 50c.....	12.50
2 barrels pitch at \$2.00.....	4.00
1 day beacon.....	5.00

Cost of West Jetty material.....	\$4,716.63
Cost of West Jetty material (brought forward)	6,663.00
Labor 25% of cost of material.....	1,170.16

\$12,558.79

Superintendence and engineering, 10%.....	1,255.88
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Total cost West Jetty.....	\$13,814.67
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Total cost East Jetty.....	19,833.80
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Both Jetties	\$33,648.47
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BUOYS, MUSHROOM ANCHORS AND BEACONS.

Day beacons will be required on each jetty at the sea end. These will be very inexpensive and have been estimated for in the jetty estimate. A day beacon will also be required on the 5 ft. shoal just below the Gorge Point, near where the

lower cross section was taken. This will consist of a cluster of 3 piles driven together with boards nailed on the top. Just how many channel buoys will be required cannot be known until the jetties are finished and the channel has formed. Probably not over three (3), but I have estimated for one spare one. These buoys will consist simply of light cedar spars, red for starboard side (entering) and white for port side. They will be about 15 feet long, ironed at the lower end



COMPANY'S BOATS AT PATUCA.

and fastened to about 5 ft. of 5 $\frac{1}{8}$ " stud chain, which will be fastened to the anchor, which should weigh not less than 500 lbs. The following is the

ESTIMATE.

4 spar buoys, painted and ironed, at \$12.00.....	\$48.00
20 feet of 5 $\frac{1}{8}$ " stud chain—72.4 lbs. at .10.....	7.24
4 mushroom anchors, 500 lbs each—2,000 lbs. at .15	30.00
Total cost of material.....	<u>85.24</u>

Setting same, tug boat, 1/2 day.....	15.00
Engineering and Sup't, 10%.....	10.03
	<hr/>
	\$110.27
1 day beacon in place.....	10.00
	<hr/>
Total cost	\$120.27

DRAGGING CHANNEL.

This has been previously explained.

I estimate tug boat 2 months, at \$500.00.....	\$1,000.00
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BRINGING OUT TUG BOAT say from NEW ORLEANS.

10 days at \$20.00 (including coal), towing lighter..	200.00
Provisions, oil, waste and incidentals.....	50.00
	<hr/>
Total cost	\$250.00

VESSELS REQUIRED.

1 sea going tug boat, propeller, for towing rock....	\$6,000.00
1 river steamer, side or stern wheel.....	2,500.00
3 Amesbury dories.....	50.25
1 launch	850.00
1 Seine-boat	112.00
2 decked lighters (22 x 80 feet) for stone (to be built at Patuca	1,600.00
	<hr/>
Total cost	\$11,112.25

The tug boat should be 14 x 14" cylinders, 125 H. P., with condenser. It will be required to tow two large lighters, loaded with 100 tons of rock each, from Brewer's lagoon to the jetties and able with its tow, to stem the current of the river up to Patuca and should not draw over 5 feet. It can be sold as soon as the jetties are completed.

The river steamboat should be flat-bottomed, stern or side wheel, 60 or 75 feet long, and should not draw over 2 feet.

It will be used during construction of jetties to tow the rock lighters from Cannon Island to Brewer's Lagoon bar, where the tug boat will hook on to them. The water in the Lagoon channels through the oyster bars inside is reported by

Mr. Wood to be only 5 feet. It is possible that a side-wheel tug boat can be found drawing only $4\frac{1}{2}$ feet, that is sufficiently strong to do the work required of her at the jetties, and in that case she could navigate right up to the quarry, and so obviate the necessity of another steamer. The river steamboat, after the completion of the jetties, would be brought to Patuca and used on the up-river route, and for that service would be woodburning, with non-condensing, direct-acting engines, while the sea tug should be coal-burning with compound engines. I do not see how we can make one boat alone answer. The alco-vapor launch is 30 feet long and will be used daily in inspecting the progress of work on the jetties, taking daily soundings on the bar and alongside and in advance of the work and will save its cost in a short time in the saving of time of officer and boatmen.

If a rowboat should be used instead, it would require at least 4 good oarsmen, and none of those Indians know how to row, being accustomed only to the use of the paddle and their light cranky canoes, which are entirely unsuited for such work.

Even with good oarsmen, the force of the current is such, that much time would be lost in every return trip from the jetties, and with a strong head wind and current a row boat can hardly stem it.

The launch would also be wanted for a reserve boat, to carry the mail on up the river route, in case the regular steamer should be temporarily disabled, a contingency liable to occur at any time. The naphtha launch is very much cheaper to run than a row boat. One of the lighters should be bought in the States and towed out by our tug boat, as it will be immediately needed to unload our freight on outside the bar and bring it up to the town, as the chartered vessel bringing it would draw too much to enter the river.

The other lighter should be built at Patuca as soon as the lumber for it can be cut. Two lighters will be required for the jetty work to bring the stone from Brewer's Lagoon, as one lighter can be left at the quarry to be loaded while the other is being towed to the jetties. In cases where an apron mattress has to be set, two lighters, loaded with rock have to be used, one on each side of the mattress. The stone is thrown off by hand on to the mattress and it cannot be properly distributed over the mat from one lighter. After the jetties are completed one lighter can be towed back to New Orleans by our returning tug boat and sold.

SAW MILL.

In order that we can be able to build the jetties, buildings and lighter required at the low cost estimated, it is imperative for us to cut our own lumber and for this purpose we should have a small saw-mill to supply lumber to the settlers during all the time we are operating on the river. It would be much better for the Company to own this mill and run it in their own interest, to supply them first with the large amount of lumber required for their different constructions and also to receive an income from the sale of lumber, rather than to intrust this enterprise to another party, whom they could not fully control.

We shall also need for the finishing work of our houses a matcher and dresser, a wood lathe, a jig saw and a shingle cutter, all to be run by the same power.

I consider that the best place to locate this mill will be at Rita Tara in the midst of the hard pine timber for the following reasons:

1. It will reduce the length of the haul of the logs.
2. By locating the mill at Rita Tara, we save the expense of making a log pen, which we would have to have if the mill was at Patuca to hold the log rafts while being cut up. This log pen would cost \$1,183.65 and none will be required at Rita Tara.
3. By locating the mill at Rita Tara, we form the nucleus of a settlement and provide work for some of the settlers there.
4. After the jetties, wharf and buildings are finished at Patuca, the demand for lumber will come from the vicinity of Rita Tara, for the houses, fences, etc., of the colonists and it will be much easier to raft the little lumber required down to Patuca, than up to Rita Tara, and just as easy to raft down the cut lumber as the logs, and the lumber would all be piled on shore at Patuca as soon as it arrived and no log pen required for it.

ESTIMATE.

1 Saw mill, 30 H. P. engine, boiler, 54-in. saw.....	\$2,500.00
1 matcher and dresser, jig saw and lathe.....	800.00
1 shingle cutter	175.00
Setting up same	25.00
Building log ways	16.00
3 M. feet P. 1. lumber for mill shed, at \$6.00.....	18.00
10 M. shingles, at \$6.00.....	60.00

Nails	4.00
Labor	179.90
Total	<u>\$3,777.90</u>

BRICK, TILE and PIPE YARD.

The same remarks apply to a brick tile and pipe yard as to the saw mill. It should be located in the vicinity of Rita Tara, where plenty of clay abounds and will furnish labor for some of the colonists; capacity 2,000 brick or tile per day. Roof tiles can be made as cheaply as shingles and they are practically everlasting, tiles on some convents in Europe being known to have been laid over 800 years. They also are a protection from fire and are much cooler than either shingles or galvanized iron, and they cost $\frac{1}{3}$ less than the latter and are very easily made. Machines are made that will make, brick, tile and pipe.

ESTIMATE.

Leveling and smoothing off $\frac{1}{2}$ acre for yard.....	\$25.00
1 pug mill (horse power).....	150.00
1 kitchen, 6 x 8.....	21.00
1 office do.	21.00
1 quarters, 18 x 14, lumber 2,247 ft. B. M., at \$6.00..	13.00
Shingles or tiles	6.48
Hardware, finishing, doors, sashes, etc.....	36.05
12 Foundation posts, at 25c.....	3.00
1 Kiln shed 18 x 14, lumber, etc.....	12.17
Drying do 36 x 28.....	24.34
Labor, 25%	<u>33.63</u>
	\$346.15
Engineering and Superintendent 10%.....	<u>34.62</u>
Total cost	\$380.77

LIME AND CEMENT KILN.

Considerable quicklime and cement will be needed, as well as bricks and tile and will be sold also from time to time to the colonists. A lime kiln should be built at the mouth of Gualpitanti Creek, where a large ledge of excellent lime rock crops out on the right bank of Patuca River.

1 stone kiln, 8 feet diam. outside 10 ft. high, 18.6 cu. yds. at \$2.50.....		\$46.50
1 set of old grate bars, 960 lbs at \$.03.....		28.80
1 ranch		25.00
1 storehouse, 8 x 10, lumber 786 ft. B. M. at \$6.00.....	\$4.72	
500 shingles at \$6.00.....	3.00	
8 foundations blocks at \$.25.....	2.00	
Whitewash	1.00	
Hardware, etc.	4.45	15.17
Add for labor building storehouse.....		3.54
		<hr/>
		\$119.01
Engineering and Superintendent and omissions 20%.		23.80
Total cost		\$142.81

A TAR KILN

will also be a convenience and considerable tar and pitch will be needed on the vessels, jetty and wharf.

½ doz. kettles at \$60.00.....	\$30.00
½ doz. axes at \$12.00.....	6.00
½ sharp pointed shovels at 12.00.....	6.00
Labor, 4 men ½ month at \$10.00.....	20.00
Labor 2 men 2 months at \$10.00.....	20.00
	<hr/>
Total cost	\$82.00

PATUCA STORE HOUSE, 20 x 25.

Lumber, framing, shingles, doors, windows, hard- ware, shelving, counters and labor, etc.....	\$189.20
Painting	12.96
Superintendent, errors and omissions 10%.....	20.22
Total	\$222.38

This building will be located at Patuca and will be the first building to be built when the expedition arrives. The lumber will have to be brought out from the States.

SCHOOL HOUSE, 20 X 25.

This will be the second building, to be put at Patuca and will be used for quarters by the 1st expedition, until the hotel

can be built. The lumber must be brought out from the States.

Framing, boarding, roofing, windows, doors and labor.		\$180.00
Building porch and steps.		8.93
Painting.		12.96
Closets, lumber 557 ft. B. M. at \$6.00.	\$3.34	
Doors, Closets, hardware, shingles, etc.	9.36	
Whitewash.	1.00	
Sewer and water 2 w. c. 1 urinal, 1 lavatory and connections.	69.75	
Labor 25%.	20.61	104.06
Furniture.		50.00
		<hr/>
		\$355.95
Superintendent 10%.		35.59
		<hr/>
Total cost.		\$391.54

The closets and water piping and furniture will not be put in until the building is needed for a school.

PATUCA HOTEL.

This hotel or boarding house will be needed at once at Patuca for the offices and accommodations for the officers and mechanics employed on the jetties and in the other works and shops.

It will be built from the first lumber cut by the mill and should contain a kitchen, dining room, General Manager's Office, drafting room and doctor's office, with 17 sleeping rooms. After the port is opened it will be needed for the reception of colonists pending their passage up the river to their lands and also for those permanent residents at the port, that do not have families. The store should be connected with it.

ESTIMATE.

96 M. T. B. M. lumber at \$6.00.	\$576.00
Roofing, doors, windows, finials, fittings, balconies, finishings, hardware, kitchen, chimney.	907.69
Plumbing and water fittings.	365.35
Foundations.	30.55
Lightning rods.	15.40

Painting 2 coats	405.50
Labor 25% of cost of material.....	470.07

\$2,770.56

Superintendent and contingencies, 10%.....	277.06
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Total cost\$3,047.62

Detail plans of the hotel have been made and therefore this estimate will not be changed.

BUILDINGS AT RITA TARA.

The same sized hotel will be needed at Rita Tara after the River line of Navigation is opened to accommodate settlers while hunting uplands. It will probably be best to lease this hotel and the one at Patuca to some competent person to run and board the officers and mechanics.

A loggers' camp will also be required at Rita Tara for the men to live in, 18 x 14 and a store house of same size.

Cost Rita Tara Hotel.....\$3,047.62

“ Store House 73.76

“ Loggers' Camp 73.76

Total cost\$3,195.14

SHOPS AT PATUCA.

will be required to do the carpentering, joinering and iron work for the various buildings and for repairing and fitting ships, boats, etc., for the repairing of engines and the preparing of the iron used on the jetties, wharf, water works, etc., repairing tools and sharpening drills. Power for running lathes will be required and the shops should be connected.

1 machine and blacksmith shop, 18 x 14..... 73.76

1 carpenter's shop 73.76

Total cost\$147.52

QUARRY CAMP.

This will be located on Canon Island in Brewer's Lagoon. There will have to be accommodations for 10 or a dozen men, but the regular gang will not exceed 6 men, including the cook.

There is now on the island 1 frame building used as an office and store house, about 18 x 25 feet, and 1 tool house about 10 x 15 feet, with galvanized iron roof, part of which has been pulled off and carried away. There are also 3 thatch roofed shacks and a boat house with a shingle roof about 30 by 60.



NATIVE CHILDREN—PATUCA.

The blacksmith shop adjoining has tumbled in, as also the house of the manager on the hill. There are about 6 large pit-pans, in good state of preservation in the boat house. All the

houses are opened or unfastened. In the tool house there are a few picks, bars, axes, chains, blocks and tackle, one or two cross cut saws, a keg of log dogs and a few other minor tools. I could find no tools in the ruins of the blacksmith shop, except a few rusty files.

I would consider the following estimate of value of tools, boats and buildings, as ample.

ESTIMATES OF OLD PROPERTY ON CANNON ISLAND, BREWER'S LAGOON, HON.

3 frame buildings, one in good repair, the other two in bad state	\$100.
6 pitpans (large)	60.
Tools	40.
3 shacks	25.
	<hr/>
	\$225.

It could probably be bought from Mr. Easterbrook for about half price.

WATER WORKS AT PATUCA.

These are required under the concession and will lessen insurance and promote good health of the town. It is proposed to take the water from an infiltration well located about $\frac{1}{4}$ of a mile west of the town in the **arenaceous terre plein**, of the old sea beach, belonging undoubtedly to the present geological age. The elevation of the ground here is about 2 to $2\frac{1}{2}$ feet higher than the river bank in the town and the ground is divided into alternate low banks and sloughs running E. & W., the latter having evidently been grindles in the ancient sea beach. The drainage is all toward the river at Patuca.

It is proposed to locate the infiltration well in one of these sand banks, which will strain the water, from whence it will run by gravity in a 6" vitrified stone-ware pipe, to the pump well, situated 1 block west of the Plaza and two (2) blocks west of the river, as shown on plan of the City of Patuca. The pump will be run by a wind mill and will deliver the water in a tank high enough to throw the water over the top of the tallest building in the town. From this tank, distributing pipes will deliver the water to all parts of the town under pressure. It is proposed to use cement-lined wrought-iron pipe, as being cheaper and better, as the water is free from

iron rust. If the growth of the town in the future should endanger the purity of the source of supply, the pipe can easily and inexpensively be extended to the border of Musmusalken slough, which is a long narrow grass pond with sandy bottom, that discharges into the Patuca river, in flood time, just above the village.

ESTIMATE FOR WATER WORKS.

1 infiltration brick well, 10 x 4 x 8 deep, with cross porous brick-wall, laid in cement with wooden house built over it. 1 pump well of same size, with house, with supply pipe, cost.....	\$106.36
2,689 ft. cement lined pipe.....	151.65
Fire plugs, gates, taps T's and elbows.....	36.80
1 fountain for plaza.....	50.00
1 pump, tank, windmill and trestle.....	300.00
Opening and closing trenches, 150 cubic yards at 20c.	30.00
Laying pipe and setting up pump.....	40.00
Labor digging wells and laying brick.....	28.40
	<hr/>
	\$743.21
Engineering, superintending and contingencies, 15%.	111.48
	<hr/>
Total cost	\$854.69

SEWERAGE AND DRAINAGE AT PATUCA.

It is essential to the health of Patuca that due regard be given to the drainage and proper sanitation of the place. There are several small creeks, draining the ponds, that lie to the west, that discharge into the Patuca river, through the town, the largest of which is Frank's creek, about 20 to 30 feet wide. In September my men cut a ditch 300 feet long from Frank's creek to John Wood's creek shown on plan, to relieve the former, which was running full from the late rains. It will be necessary to do some cleaning out of these creeks and straightening and filling in. A system of sewerage has also been designed for the town, and it will at once be necessary to build it in the street, where the hotel and school house are situated. As planned it can be extended as the needs of the town require.

ESTIMATE.

Clearing creeks and widening ditches, already dug...	\$100.00
2 Walkers Patent automatic flush tanks.....	27.00
Vitrified and iron pipe and Y.....	79.48
3 Manholes at \$25.00.....	75.00
Digging holes for Manholes and flush tanks, and digging and refilling trenches.....	57.12
Laying pipe	13.50
Engineering and Superintendent.....	50.44
Total cost	<u>\$402.52</u>

BUILDING STREETS AND PLAZAS AT PATUCA.

The Government of Honduras has agreed to grant 1 square league at Patuca for a town and it is proposed to lay out the town from the creek on the south of the Mill clearing, along the river and down to the sea, covering the site of the present Indian Village.

It is proposed at present to lay out and clear and grub and grade the streets around 25 blocks, near where the Indian Village now stands and build small bridges and culverts across the creeks and to build a plaza fronting the Custom House. I estimated this work will cost as follows:

ESTIMATE FOR BUILDING PATUCA.

Clearing and grubbing about 8,720 ft. streets, 12 acres at \$20.00.....	\$ 240.00
Surfacing and grading 6,737 cu. yds. at 10c.....	673.70
Engineering and Sup't, 10%.....	91.37
Total	<u>\$1,005.07</u>
Plazas 2.9 acres at \$20.00.....	\$58.00
Engineering and Sup't 10%.....	5.80
Surveying streets and lots, 1 party, 4 weeks.....	325.00
Total	<u>\$1,393.87</u>
Bridges and culverts 143 ft. 16 piles (10 to 40 ft.) at 50c.....	\$8.00
3,663 feet B. M. lumber at \$6.00.....	21.97
Iron, bolts, nails and spikes.....	3.23
Material	<u>\$33.20</u>

Labor 4 men on culverts 5 days at \$3.00..	15.00	
63 piles driven and capped at \$3.00.....	189.00	
2 men finishing, 3 days at \$2.25.....	6.75	
	<u>\$243.95</u>	
Engineering and Superintendent 15%	36.59	280.54
Total cost building Patuca.....		<u>\$1,674.41</u>

ESTIMATE FOR BUILDING RITA TARA.

In the absence of any survey at Rita Tara, I can only make an approximate estimate of the cost of laying out and building a town here, but as the conditions are much more favorable, there being no swamps, ponds or creeks and no underbush, the problem will be much easier. The following estimate is not far from correct:

Surveying, 1 party, 4 weeks.....	\$300.00	
Surfacing and grading	830.00	
Total		<u>\$1,130.00</u>

TELEPHONE LINE TO JETTIES.

While this is not an absolute necessity, it will save time and be a great convenience.

1 mile wire 358 lbs. at .06 ¹ / ₂	\$23.27	
18 poles, set, at \$1.00.....	18.00	
18 insulators .....	.75	
2 telephone instruments	50.00	
Stringing 1 day, \$5.00, Sup't & contingencies 10%.		
\$9.70	14.70	
Total		<u>\$106.72</u>

CUSTOM HOUSE WHARF.

Under the concession this wharf has to be 600 x 40 feet, built alongside the shore, in front of the Custom House and will have a depth in front of 16 to 18 feet, at low tide. As the water is never salt here and only brackish about 2 months in the year, the sea worms cannot be very destructive here, even if they exist at all. In order to comply with the terms of the concession, however, I would recommend that the piles

be treated with Carbolineum Avenarium, which engineers report to afford efficacious protection, and which is inexpensive.

ESTIMATE.

600 piles, at .50c.....	\$300.00
188 M ft. B. M. lumber at \$6.00.....	1,128.00
8,700 lbs. drift bolts, at .0225c.....	195.75
1,350 lbs. spikes and nails, at .025c.....	33.75
200 lbs. screw bolts and nuts and washers, at 10c..	20.00
150 ft. 195 lbs. chain or wire rope, at 12c.....	23.40
1 barrel pitch.....	2.00
	<hr/>
	\$1,702.90
Labor 25%	425.72
Driving and capping 600 piles, at \$3.00.....	1,800.00
	<hr/>
	\$3,928.62
Sup't and engineering and contingencies 10%.....	392.86
	<hr/>
Total cost	\$4,321.48

PATUCA CUSTOM HOUSE.

100' 11" x 44' 11", Framed Building, two stories.	
Earth excavation for foundations, 75 cu. yards at 25c	18.75
Masonry piers and foundations for scale 18½ cu. yards at \$2.00.....	37.00
106 M Ft. B. M. lumber, at \$6.00.....	636.00
272 lineal feet Balustrade, at \$1.00.....	272.00
2 finials at 50c., \$1.00; 20 balcony do. at 40c., \$8.00;	9.00
2 bundles laths, \$8.50.....	17.00
½" x 5 ¾" siding 8½ M at \$20.00.....	170.00
1-30 ft. flag pole	10.00
100 squares corrugated iron roofing, at \$6.50.....	650.00
510 ft. hip and ridge cap at .07c.....	35.70
155 ft. gutters at .06¼ \$6.69 and 25 ft. spout at .06¾, \$1.68	11.37
2 newel posts, at \$35.00.....	70.00
18 doors, at 4.00	72.00
38 glazed windows, at \$3.00.....	114.00
9,000 square yards tarred paper, 1,500 lbs. at .03c....	45.00
9,000 square yards felt paper, 1,500 lbs., at .03c....	45.00
8 barrels American cement, at \$2.00.....	16.00
16 barrels lime, at .80c.....	12.80

Hardware, fittings, nails, lock, butts, bolts, etc.....	118.21
1 platform scale, capacity 5,000 lbs.....	125.00
7, 1 basin lavatories, at \$2.25.....	15.75
1, 7 basin lavatory.....	30.00
	<hr/>
	\$2,522.18
1 urinal \$2.00, 4 syphon jet water closets and fixing, \$71.00	73.00
11 water cocks, at .50.....	5.50
Stone, iron and lead pipe, Y's traps and bends....	108.90
	<hr/>
Cost of material	\$2,700 58
Labor, 25%	677.39
Painting in and out	239.44
	<hr/>
	\$3,626.41
Superintendence and contingencies 10%.....	362.64
	<hr/>
Total cost Custom House.....	\$3,989.05

VEGETABLE GARDEN AT PATUCA.

Living as the workmen will have to, largely on salted or canned meats, there will be danger of scurvy and other kinds of sickness, unless fresh vegetables can be obtained in plenty. The Indians do not raise any garden vegetables, only rice, corn, sugar cane, plantains, bananas, pineapples and other fruit, and it will be necessary for the health of the expedition to plant a small garden to raise potatoes, turnips and other garden truck, which can be readily done.

Wire fence, 1 bundle (abt. 125 lbs.), or 1,260 ft. at \$4.00 per bundle	\$4.00
Cleaning and grubbing 2 acres at \$45.00.....	90.00
Garden seeds	5.00
1 gardener 6 mos. at \$11.00.....	66.00
	<hr/>
Total 1 year.....	\$165.00

This matter can probably be arranged with some of the colonists, the Company buying from him, and this, with what visiting ships would require, would furnish a good start to a gardener.

SNAGGING UP TO GUALPITANTI.

But 11 snags could be discovered obstructing the channel, as far up as I went, viz: Gualpitanti. There are probably



SURF BATHING AT PATUCA.

relatively more on the upper half of our navigation, but just how many is unknown. The snagging outfit required will consist of a decked lighter, with a swinging boom, a boiler

and hoisting engine, chain, tackle, grapnel, dynamite and electric firing apparatus, axes and a cross cut saw. The steamboat will be required to tow up. The cost of extracting snags in the United States is about \$5.00 a piece. As there are so few in this case, the relative cost will be greater. A pile driving engine and boiler can be used, as it will not be necessary to do any snagging until the jetties are completed.

Extracting 11 snags at \$10.00, \$110.00.

INSPECTING LANDS AND TIMBER.

As soon as possible after the jetty channel is opened, or before, a thorough inspection should be made of all the lands embraced in the grant, for the double purpose of deciding where to run the lines and for making estimates of value of timber, cost of logging, amount of rubber, vanilla, sarsaparilla, turpentine, and medicinal gums, resins, etc., metals, minerals, economic earths, clays, etc. and location of different varieties of agricultural lands.

1 inspector, 3 boatmen and guides 2 months at	
\$12.00 per day	\$720.00
Provisions	75.00
Total	<hr/> \$795.00

This inspection could be made by the Chief Engineer, at odd times and no extra appropriation would be required for it.

UPPER TERMINUS STATION.

A building for a warehouse and lodging house will be required at the upper end of our navigation for the accommodation of passengers and freight. There should also be on hand there to rent to passengers, not less than a dozen saddle and cargo mules, with drivers, in order to stimulate travel by our route. These, of course, will not be required until the navigation is established. The distance from our terminus to the nearest large town, Catacamas, is as near as can be ascertained, 60 miles, and passengers going up the river will require some such facilities to continue their journey. The mule train can very properly be a private enterprise, but at first it may be necessary for the Company to supply them, at customary rates, so I have estimated for them and later they can be sold to some of our colonists who would like to engage in the business.

ESTIMATE.

Warehouse and lodging house, with outbuilding and fencing	\$1,200.00
12 mules at \$40.00 each.....	480.00
	<hr/>
Total	\$1,680.00

LOGGING OUTFIT.

1 pr. log wheels, tongue, axles and yokes, etc.....	\$100.00
2 yoke oxen	150.00
Chains, dogs, and cant hooks and axes.....	50.00
	<hr/>
Total	\$300.00

These will be wanted as soon as expedition lands.

PILE DRIVERS.

2, with boilers, hoisting engines, pumps, hammers, pulleys, etc., will cost, if framed at Patuca from Honduras lumber \$1,200, and will be needed at once for work on jetties. The reason for two has been already explained and is imperative.

SURVEY OF GRANT.

The land grant is 100,000 hectares—247,110 acres, and must be taken in alternate lots of 1,000 hectares each, which is therefore equivalent to surveying 494,220 acres—772.22 square miles, equivalent to running about 1,000 lineal miles to survey them into 1,000 hectare lots. Most of this land will be open pine land, but some of it will be very thick and rough forest. The price paid for survey of open pine land by the U. S. Land Office is \$14 to \$16 per mile. For thick woods the price is \$18 to \$24. Average of all \$18.00 per mile. This is 1,000 miles at \$18.00..... \$18,000.00

This does not take into account the meander lines along navigable streams, and around lakes and large ponds, which cannot be estimated for in the present state of our knowledge of the country, or any subdivisions into smaller lots than 1,000 hectares. The subdivisions can be paid for as surveyed by the settler. It includes making a map of each 1,000 hectares.

SHIP RAILWAY.

This will be absolutely necessary for our own use to enable us to scrape and paint and caulk our vessels and protect them from the sea worms. Mr. Wood's steamer was lost for want of a railway to haul it out.

It will probably pay for itself by the use made of it by coasters and other vessels. A good location is presented at the mill site clearing at the upper end of the village of Patuca. It would not be advisable to make it with a capacity greater than 50 tons at first, owing to the great cost for larger tonnage.

ESTIMATE.

Estimate lumber 33 M ft. B. M. at \$6.00.....	\$198.00
Drift bolts 676 lbs., at .0225c.....	15.10
Screw bolts, 61 lbs. at .0325c.....	1.98
Twenty D. nails, 30 lbs., at .0235.....	.71
Straps, 124 lbs. at .0225.....	2.79
Stud chain 1" 185, 2 lbs., at .08.....	14.82
Stud chain ¾" 208.4", at .10.....	20.84
Stud chain 5-16" 361.6", at .12.....	43.39
	<hr/>
	\$297.63
Rip-rap rock (placed) 151.1 cu. yds., at .75c.....	113.33
Earthwork (about) 231.5 cu. yds. at .20c.....	46.30
Drum and lever.....	2.00
80 Rollers, 6 inch diameter 2 feet long (lignum vitae) .480 M. B. M. at \$30.....	14.40
Labor, framing	123.42
Setting up	24.00
	<hr/>
	\$621.08
Engineering and Supt. and contingencies 10%....	62.11
	<hr/>
Total cost.	\$683.19

HOISTING CRANE.

This will be needed at once for raising heavy weights such as boilers, engines, etc., from the lighters to the bank, and will always be needed later on the wharf. The hand winch and fittings should be bought in the States and shipped out in the first consignment.

The boom can be made at Patuca. Cost, \$100.00.

STEAMBOAT WOOD STATIONS.

On Patuca River between Patuca and Rita Tara (1 at Patuca,
1 at head of pass and 1 at Rita Tara).

3 wood shacks, at \$15.00.....	\$45.00
15 cords wood in each, 45 cords, at \$2.50.....	112.50
1 station at Brewer's Lagoon 20 cords at \$2.50.....	50.00

Total cost.	\$207.50
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TOOLS, PLANT AND STORE GOODS.

1 set Blacksmith tools, see appendix.....	\$90.00
1 set Machinists tools see appendix.....	680.00
1 set Carpenters and Calkers tools (p. 13). ..	150.00
1 set Plumbers and Roofers and Masons tools.	75.00

Total tools.\$995.00

All other plants, such as blocks, tackle, anchors, capstans, small boats, wheelbarrows, drills, household goods, medical stores, provisions and supplies, \$10,000.00.

Many of these supplies, household goods, medical stores, provisions, etc., will be sold to Indians and Colonists. There will also be a stock in store of dry goods, nic-nacks, yankee notions, clothing, etc., for general trade and particularly for the Indians. Total, \$5,000.00.

These 2 estimates are not much more than guesses.

FREIGHT.

Charter of schooner. The Brig Carib makes a trip every 2 months to Truxillo, calling at Bay Islands and some West India ports, and would probably go to Patuca, which is 130 miles East of Truxillo, if assured that a competent lighter and tug would be on hand for unloading. There will be about 200 tons of freight, but a small part including lumber for quarters and warehouse can be bought in New Orleans or Mobile and taken out by our tug to be used in the preliminary work of the expedition.

In 1880-90, charters from New York to Greytown used to run from \$800 to \$1,200, according to whether the captain could obtain a return cargo from any point on the route or near by.

In our case, I have estimated the smallest amount as all that will be required as if the "Carib" is freighted, she will have her regular cargo for return. (This for first invoice only. Our own boats afterward).

200 tons freight at .002 per lb., \$800.00.



CURASSOW—PATUCA RIVER.

TENTATIVE WORK.

The following works may or may not be required, in whole or in part. This is a matter that it is impossible for anyone

to foresee and answer. As previously stated these are our reserves, that may be needed in our conflict with the forces of nature and may not.

Some part of them may be needed and not the whole. While I do not believe that any of these, except possibly the last two, will be needed, still it would be an unwise commander, that kept no reserves for a general engagement and it is quite probable that two or three mattress aprons will be needed and possibly 2 or 3 groynes and the additional stone may be needed or part of it, and it is not improbable that we will have to extend the jetties during 25 years a few hundred feet further, but no one can say positively. I have thought it best, with this explanation, to include these works in the estimate in order to be on the safe side.

DREDGING.

It is required by our contract to obtain 12 feet of water in the channel. The distance between the 12 foot curves is now 2,180 feet, with an extreme cut, on the crest of the bar, of 6.5 feet and for a channel 300 feet wide, this gives 108,644 cubic yards of sand and mud to be removed which at 10c. per cubic yard equals, \$10,864.40
Add for Engineering and Supt. 10%..... 1,086.44

Total cost. \$11,950.84

It is confidently believed, however, that by dragging the channel as previously estimated for, this material will all be swept out to sea, without any necessity for dredging except possibly a small amount near the center of the harbor, between the 12 and 9 foot curves, where the distance between the jetties is greater.

MATTRESS APRON.

As previously explained if the work is faithfully watched and carried on as recommended, and all goes well, these will not be required. It is possible, however, that some cases may occur, where they will be needed, but if so, probably only in a few places. I have, however, estimated for these protecting aprons along both sides of both jetties 40 feet wide and wider at the sea ends, the most extreme case possible, viz.:

51,022.22 square yards, at \$1.00..... \$51,022.22

There is, however, no reasonable presumption, that more than 1,000 feet in length by 20 feet in width, will under any circum-

stances be required, equal to 20,000 sq. ft. or 2,222.22 sq. yds., at \$1.00, \$2,222.22.

The details of the construction of these mattresses is shown on the plan of Toom Toom dam, and the cost before setting will be about 55 cents per square yard.

GROYNES.

The use and construction of these has already been explained. They are built exactly the same as a part of the main jetty of the same width.

Where mattresses are used groynes will not be required unless it be to promote greater scour, as already explained. This is not anticipated. Under some contingencies that might arise, 20 groynes might be required, 10 on each jetty, and I have accordingly estimated for that number 50 feet long each or 1,000 feet in all (and 10 feet wide), at \$6.00, \$6,000.00.

JETTY EXTENSION.

The conditions under which this might become necessary have already been explained. While the possibility exists that in the ensuing 25 years some inconsiderable extension will be required, my studies and computations lead me to believe, on the other hand, that 12 feet of water over the bar will be obtained before the jetties reach the length I have charted, provided their construction is proceeded with simultaneously, in which case, of course, the cost will be greatly reduced.

ESTIMATE EAST JETTY EXTENSION.

100 ft., 18 ft. wide.....	\$1,603.57
400 ft., 20 ft. wide.....	9,037.81
Sea end	542.97
	<hr/>
	\$11,274.35

ESTIMATE WEST JETTY EXTENSION.

400 ft., 18 ft. wide.....	\$6,774.28
400 ft., 20 ft. wide.....	9,037.81
Sea end	542.97
	<hr/>
	\$16,355.06

Brought forward	27,629.41
Rebuilding 2 day beacons.....	10.00
Total cost	<u>\$27,639.41</u>

EXTENSION OF WATER WORKS AND SEWERAGE SYSTEM.

This is, of course, a matter of uncertainty depending on the growth of the town of Patuca. I would consider it proper to estimate on doubling the service in 2 or 3 years, viz.:

Water Works extension.....	\$854.69
Sewerage "do."	402.62
Total cost	<u>\$1,257.31</u>

TELEGRAPH LINE FROM PATUCA TO YRIONA (60 MILES).

Telegraph Wire No. 8, 21,499 lbs., at .06½c.....	\$1,397.43
Poles, 1,056, at \$1.00.....	1,056.00
Insulators, 1,056, at .02c.....	21.12
2 Telegraph Instruments.....	50.00
2 Batteries	14.00
½-mile cable (for crossing inlets).....	25.00
½-mile extra wire for fastenings.....	11.64
Labor, Setting poles, 1,056, at .25c.....	266.50
Stringing, 32 days, at \$5.00.....	160.00
1 mule and cart hauling poles and wire 32 days at \$3.00	96.00
4 men clearing line, 15 days, at .42c.....	25.20
Surveying line, party 20 days.....	250.40
	<u>\$3,373.29</u>
Engineering and Superintendent, 10 per cent.....	337.33
Total cost	<u>\$3,710.62</u>

RIVER REVETMENT (NOT TENTATIVE).

The river all along the front of the town of Patuca seems to be rapidly eroding its west bank, as appeared from Cocconut trees standing in the water, and from the crumbling off of the bank and from the fact that many of the Indian shacks have had to be

moved back and one house has washed away. Just how fast the erosion is going on, we have no means of knowing, until we can compare the survey already made with a new survey of that part of the river bank. There seems little doubt, however, but that the bank will have to be protected very soon to prevent the town from washing away. The length requiring protection is 2,240 feet, and the best plan will be to drive a line of piling in the river in front, capping it with longitudinal stringers and driving a double row of sheet piling of slabs behind them and filling in the back with Papta or brush filling.

As no detail plans have been prepared of this work yet, the estimate will be necessarily somewhat unsatisfactory, but I think not far from the truth. Perhaps bamboo piles can be used and thus reduce the cost.

ESTIMATE.

188 piles, at .50.....	\$94.00
3½ M lumber, at \$6.00.....	21.00
44 cord slabs, at .50.....	22.00
	<hr/>
	\$137.00
251 lbs. ½" drift bolts, at .0225.....	5.65
464 lbs. nails, at .0235.....	10.90
213 cords papta, brush filling, at \$1.00.....	213.00
6 gallons pitch, at .07.....	.42
Labor driving and capping 188 piles, at \$3.00.....	564.00
Placing low water brace and deadmen; 2 men, 11 days, at \$2.00.....	22.00
Slabbing; 3 men, 23 days, at \$3.00.....	69.00
	<hr/>
	\$1,021.97
Engineering and Superintendent, 10 per cent.....	102.20
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Total cost	\$1,124.17

TOOM TOOM SUBMERGED DAM.

I have made a preliminary estimate, which follows, of the work required at this place, but as previously stated in this report, it is impossible to make a close estimate of the cost of this work until the low water plane is established and the current observations worked up, which can only be done at the low water stage of the river.

By reference to the plan of the head of Toom Toom Pass it

will be seen that at the head of the Pass the depth is 48 feet, and it is proposed to build the submerged dam at a point in the Pass 400 feet below the head, where the depth is from 19.3 feet to 23 feet in the channel, at the stage of water found at the time of the survey, which was supposed to be about 6 feet above low water.

This is the shoalest place in the Pass, and the dam will have a length of 247 feet on the crest. During high water we have all the water at Patuca that is wanted, but at the low water stage it may be desirable to maintain a greater flow there, in order to preserve the scouring force "over the bar." As I was not there at that season I cannot speak positively on the point. It will be necessary, before deciding upon this dam, to ascertain the velocity and discharge of the river at the Gorge, and also at the head of the Pass at low water stage and to observe the action of the current over the bar between the jetties after they are built. We will then have the data by which we can compute the height of the dam above the low water plane, necessary to produce the results aimed at, and then, and not until then, can we make anything like a near estimate of the cost. The plan proposed is to drive a triple row of piles across the Pass 6 feet apart from center to center each way. These will be capped with stringers and cross caps, secured by drive bolts and braced up and down stream by spur shores let into the piles near the head and bolted with screw bolts.

A triple row of 2" sheet piling will be driven along the lower longitudinal stringer and spiked to it with 12" spikes. The cross caps will be on top of the stringers and will be given a drop up stream. The up-stream spur-shore is intended as a fender from logs and snags, brought down by the current, and it is expected that the reach between the dam and the main stream will speedily fill up with snags and mud to nearly the level of the dam, acting as a protection.

The piles should be driven from a lighter, by the water jet, butt end down, and the work should be down at dead low water stage of the river and, with lumber and piles all ready, should not occupy more than 30 days.

The bays between the two lower rows of piles will be filled with alternate layers of bamboo logs and rock, and the bamboo will be cut out at each joint and, as in the jetty, will fill up in the same way with sand and silt.

ESTIMATE OF COST OF SUBMERGED DAM.

155 piles, 30 feet long, at .50.....	\$77.50
56 piles, 15 feet long, at .25.....	14.00

20 M 2" sheet piling, at \$6.00.....	120.00
7 M lumber, at \$6.00.....	42.00
1,296 bamboo logs, 30 ft. long, at .10.....	129.60
456.3 cubic yards rip-rap rock, at .75.....	342.23
569.15 lbs. drift belts, at .0225.....	12.81
870.2 lbs. screw bolts with nuts and washers, at .0325.	28.28
572 lbs. 12 spikes, at .025.....	14.30

LABOR.

Grading bank 118.5 cubic yards, at .20.....	23.70
Driving and capping 155 piles and spur shores, at \$3.00	465.00
Setting and capping 56 posts, at \$1.75.....	98.00
Making and driving and spiking 180 sheet piling, at \$2.00	360.00
Filling in 465.3 cubic yards stone, at .20.....	91.26
Filling in 361.5 cubic yards logs, at .20.....	72.30
	<u>\$1,890.98</u>
Engineering and Superintendent, 10 per cent.....	189.10
Total cost	<u>\$2,080.08</u>

EXTRA ROCK FOR SETTLEMENT ON JETTY.

After the lapse of time, say one to two years, it generally happens that jetties require to be topped out with more rock on account of settlement, compression and wash. Just how much will be required for this purpose in our case it is impossible to say. I have allowed for one foot of settlement and wash off, which will probably be enough.

East jetty, 1,059.5 cubic yards at 55c.....	\$582.73
West jetty, 676.7 cubic yards at 55c.....	<u>372.18</u>

Throwing on 1,736.2 cubic yards at 20c.....	<u>\$954.91</u>
	<u>347.24</u>

Total cost	<u>\$1,302.15</u>
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Additional Engineering (not included in foregoing) :

Gauging of River Patuca at low water stage.

Gauging of cut-off at low water stage.

Borings at bar.

Borings at cut-off.

Soundings and inspecting of jetties and charting every month ten surveys.

Charting gauging at Patuca and computations.

Charting gauging at cut-off and computations.
Charting upper river from Survey already made.
Computations of up river latitude and longitude.
Plans of town house at Patuca.
Plans of warehouse at Patuca.
Plans of sawmill at Patuca.

These plans are made.

Plans of water works at Patuca and levels.

Plans of sewage and drainage at Patuca and levels.

New plan at Patuca. (This plan is completed.)

Plan of Rita Tara.

Plan of hotel at Patuca. (This plan is completed.)

Plan of hotel at Rita Tara.

Plan of brick and tile yard.

Reconnaissance of river from Gualpitanti to road from Olancho
and chart and estimates.

Reconnaissance for canal from Carataska lagoon to Tocomocho
and plans and estimates. (If decided upon.)

Mapping reconnaissance notes of Grant. Inspection. Plan of
pile drivers.

Plan of lighter.

Plan of ship railway and estimate.

Plan of telegraph line to Yriona.

New plan Toom Toom dam and estimates.

Plan river revetment.

Plans for water works and sewerage and estimates at Rita Tara.

Outside currents and computations and study.

Of these twenty-nine items, seventeen have to be filed with the Government of Honduras and the others are needed for working plans and study, as previously explained. The cost of this work would be about \$10,000, of which \$5,000 is for the continuous periodical surveys and examinations made daily of the channel and bar, during construction, for purposes as previously explained. As it is, however, those surveys and plans will be made by the engineering force with laborers taken from the works, and their real cost will be very little and will be included in the cost of engineering, superintendence and inspection. In other words, they will be made by the engineers in the intervals between visits of inspection. It is absolutely necessary to make comparative charts of the bar and jetty channel once every month, in order to study the new regimen and be prepared for changes and contingencies. Of course these will not be as expensive and costly as the original survey, because we will have

our base lines and stations already measured and established and our ranges set up and shore topography taken, so will only have to take the soundings and locate them, and the men will be more expert by practice.



FOREMAN OF THE GANG.
SUMMARY.

VESSELS.

1 tug boat	1	\$6,000.00
1 river steamer	1	2,500.00

1 naphtha launch	1	400.00
2 decked lighters	1	1,600.00

MACHINERY AND TOOLS.

2 pile drivers	1	\$1,200.00
1 pr. log wheels, tongue, 2 yoke oxen, yokes, chains and dogs.....		300.00
1 set blacksmith and machinists' tools, lathes, planer, drill, channeller, etc., with power and shafting		10,000.00
1 set carpenters and calkers.....		150.00
1 set plumbers, roofers and masons.....		75.00
1 sawmill, shingle cutter, matcher and dresser and jig	1	3,777.90

BUILDINGS.

1 custom house	2	\$3,975.00
1 school house (at first to be used as a camp)...	1	391.33
1 hotel at Patuca.....	1	3,047.62
1 hotel at Rita Tara.....	1	3,047.62
1 storehouse at Patuca (warehouse).....	1	222.38
1 storehouse at Rita Tara.....	1	73.76
1 loggers' camp	1	73.76
1 quarry camp	1	225.00
1 carpenter's shop	1	73.70
1 hospital	1	600.00
1 blacksmith shop	1	73.76

JETTIES.

Building both jetties.....	2	\$33,632.37
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IMPROVING RIVER.

Dragging channel	3	\$1,000.00
Snagging up to Gualpitanti.....	3	110.00

BUILDING TOWNS.

Building bridges and culverts at Patuca.....	3	\$280.54
Building streets and plazas at Patuca.....	3	1,393.87
Building streets and plazas at Rita Tara.....	3	1,130.00
Building water works at Patuca.....	3	854.89
Building sewerage and drainage at Patuca.....	3	402.62
Surveying land grant.....	3	18,000.00

PLANT.

Plant, household goods, coal and oil, medical stores and provisions.....		\$10,000.00
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Stock in store.....	1	5,000.00
Freight	1	800.00

MISCELLANEOUS.

1 brick, tile and pipe yard.....	1	360.00
		<hr/>
		\$110,771.28
1 lime and cement kiln.....	1	142.81
6 tar kilns	1	82.00
1 vegetable garden	1	165.00
Telephone line to jetties.....	1	106.72
4 steamboat wood stations.....	1	415.00
Up river terminal station, mules, portrere, fencing		1,680.00
Taking tug boat, lighter and some lumber out...	1	250.00
Building custom house wharf.....	2	4,321.48
Buoys and mushroom anchor and beacon.....	3	120.27
Hoisting crane	1	100.00
Ship railway	1	705.19
		<hr/>
		\$118,850.75

TENTATIVE WORK.

Dredging on bar and in channel.....	?	11,950.84
Mattress aprons	?	2,222.22
Groynes	?	6,000.00
Jetty extension	?	27,639.41
Water works and sewerage extension.....	?	1,257.31
Telegraph line, Patuca to Yriona.....	?	3,710.62
Toom Toom dam.....	?	2,086.68
River revetment at Patuca.....	?	1,124.17
Extra rock on jetties.....	?	1,302.15
Snagging and dredging on upper river.....	?	?
Repairs	?	?
1 year insurance on buildings, 1½ per cent.....		170.68
1 year insurance on vessels, 2 per cent.....		158.00
Interest on first cost, 1 year, 8 per cent.....		14,118.54
		<hr/>
		\$190,600.37
Contingencies and omissions, 10 per cent.....		19,060.04
		<hr/>
Total cost		\$209,660.41

Of this amount those marked 1, amounting to \$68,085.83, should be expended the first year; those marked 2, \$41,929.15, will be

taken up next; those marked 3, amounting to \$23,291.99, will be postponed until later; those marked 2, \$57,293.40, are tentative works or reserves.

Some of them will be needed, and possibly all. The Toom Toom dam and the River Revetment will in all probability be required, the latter undoubtedly before the twenty-five years of the concession has expired, unless the construction of the jetties should so change the river currents as to cause the erosion now going on to cease. I would advise that this be left until the effect of the completion of the jetties can be seen. Of the foregoing items the following can be sold on completion of the works of improvement, viz.:

Tug boat, one lighter, two pile drivers, hotels at Patuca and Rita Tara, Hospital (for Apothecary), Telephone, Logging outfit, log wheels, tongue, oxen, yokes, chains and dogs, Blacksmith, Machinists, Carpenters, Calkers, Plumbers, Roofers, and Masons' tools, tar-making outfit, garden, store at Rita Tara, Loggers' Camp, Carpenter shop, Blacksmith shop, Construction Plant, Household Goods (most of them), Medical Stores and Provisions and Stock in store. These things to be sold only to parties who would operate them, all amounting to \$41,669.00, and we could also sell a lease for the remainder of the twenty-five years for the following, viz.:

Brick, tile and pipe yard, lime and cement kiln, water works and sewerage, amounting to \$5,538.07 in first cost, the rentals on which for twenty-three or twenty-four years would be considerable.

By establishing these industries we have something besides land and climate to offer emigrants. We can set them up in business and we can sell them land too, for all those that go into business will want lands and plantations.

There are innumerable other lines that we can exploit in the same way, such as lumbering for Mahogany, rosewood, ron-ron, cedar, black walnut, Lignum vitae, etc. Cutting and shipping hard pine R. R. ties, turpentine, rubber planting, fruit raising, vanilla beans, sugar making, mining, Palm oil making, fiber and rope making from cocoanut husks and banana stalks, paint making, Porcelain and pottery making, Furniture making, Tobacco manufacturing, Flour milling, Grist milling, etc.

PRELIMINARY WORK.

SUPPLIES REQUIRED, FIRST EXPEDITION.

The first thing to be done to initiate the work is to purchase a strong harbor tug boat of not over 5 feet draught, and a decked lighter about 80 x 22 feet in Galveston, New Orleans, Mobile, Pensacola, Tampa, or Key West. Also the lumber required for the ware house (to be the first quarters) and the store house. Cut a bow port in the end of the lighter and stow the lumber in the hold and a supply of coal for the tug and 2 ox yokes and chains and 1 pr. log wheels. Also carpenters' tools, axes and provisions for 2 dozen men for 3 months, and 2 large tarpaulins and Engineer's transit and 6 wall tents with flies—the tug to tow the lighter to Patuca and across the bar to the village, there to be met by the General Manager. Lumber and stores will be landed and all hands start on the erection of the quarters (afterwards to be the ware house), covering the goods with the tarpaulins in the meantime. Then the store house will be put up and goods put into it. The men will then be transferred up to Rita Tara, where they will build a shack and commence cutting logs for the saw mill, while a couple of suitable men are sent up the river to purchase 2 yoke of working oxen to haul logs to mill. In the meantime, another expedition will be organized in the States and sent out with all the tools required, and machinists, blacksmiths, plumbers, roofers, calkers and masons, with 2 pile driver hammers, hoisting engines and boilers and fittings, saw mill and boiler and planer, lathe, jig, etc. Also the Brick Mill and accessories, the lime furnace bars and deer. Stock of merchandise for store and plaut, with Medical stores and the doctor.

When this expedition arrives they will be immediately set to work setting up the saw mill at Rita Tara, and building the loggers' camp and a store there. They will also start work at once on the brick yard and lime kiln, to make lime and brick required for our larger buildings, water works and sewers, and with the first made will build the piers of the hotel, and as soon as the lumber is cut will put up the hotel, shops, etc., and make and set up the pile drivers. The tar making will also be initiated. As soon as the saw mill has completed cutting the lumber for the mill itself, the shops and hotels at Patuca, it will start in cutting out the lumber for the jetties, at the same time reserving and setting aside the best and most suitable lumber for the hotel at Rita Tara. The jetty lumber can be piled on the river bank at Rita Tara, ready to raft down to the jetties. In the meantime

another large lighter will be built at Patuca, from lumber cut at Rita Tara. When this is completed and the lumber all cut for the jetties, the loggers will be taken off from the saw mill and set at work cutting and hauling piles and bamboo logs, which will be piled on the river bank ready to raft down to the jetties. Then, and not till then, the work on the jetties will begin, and at the same time the quarry camp will be established on Cannon Island and the work of quarrying stone will commence and be carried on uninterruptedly until the jetties are completed, the logs and lumber being rafted down as wanted.

When the jetties are completed, the buoys and beacons will be set up and the Custom House and Wharf built and water works, sewerage and drainage constructed and streets and bridges built, the wood stations on the river and the terminal station built at the Wasspressni and the lands surveyed.

In the meantime trips of inspection will be made all over the grant, to determine where the lands will be selected for the Company's plantations.

The river navigation will then be established and the upper river cleared of snags, if required, and the mules purchased to rent to travellers going to the interior from our terminus, or *vice versa*, and the ship railway will be built for our use in hauling out our vessels and to rent to others.

We will by that time shortly be able to determine on the necessity of the river revetment at Patuca, the Toom Toom Dam, etc.

As soon as the jetties are completed and the hotels at Patuca and Rita Tara built, we will be ready for immigrants, *and not before*.

OFFICERS, ASSISTANTS, MECHANICS AND WORK- MEN REQUIRED.

The General Manager, besides having the general superintendence of all the work and operations of the enterprise, should be the Chief Engineer, qualified to design the works and to make such changes as may be required; to make the examinations, surveys and inspections needed from time to time, and the working plans required by the mechanics. He should have one assistant engineer, skilled in the use of the various instruments and drafting, and one bookkeeper and clerk, combined in one, to attend to the time and pay rolls, and also to sell goods from the store, mark the prices on the goods and keep the store accounts. The bookkeeper should also be appointed as Postmaster, and should be able to speak Spanish and attend to the Spanish correspond-

ence with the Government officials, under the direction of the General Manager. A physician and surgeon will be required, who might also take photographs of the work as its progresses and write up the country. He could assist also in the draughting and accounts. There will also be required one skilled and careful tug boat captain and one first-class marine engineer for the same, a man competent to make ordinary repairs to the engine and keep it in good order. It is of the first importance that this engineer be thoroughly competent on account of the difficulty of making repairs in this isolated locality.



ONE HOUR'S CATCH—PATUCA RIVER.

A good saw mill man will be required to run the saw mill, with a good stationary engineer. For the brick making an experienced man will be required. There will be needed a competent master carpenter and five or six journeymen and two or three boat carpenters and caulkers or builders, for building the lighter and making such repairs as may be needed to the steamboats.

Owing to the risk of bringing a small flat-bottomed river steamboat out to Patuca, I think it will be the best to buy all machinery in the States and build the up river steamboat at Patuca with our own lumber and men, unless one could be bought in Belize that would prove suitable, which is hardly likely.

SKILLED LABOR REQUIRED.

For the jetty work two experienced pile driving men, or wharf builders, will be required, one to take charge of the work on each jetty, who will run his own engine and superintend all the work of his jetty, and must be able to read and understand plans, and should, if possible, be experienced in similar jetty work.

There will also be required a Master Mechanic and two or three journeymen and a blacksmith and helper. The latter will be kept constantly employed preparing the bolts and straps for the jetties, making and sharpening drills for the rock quarrying, making log dogs for rafts and general repairing work. The former are liable to be called on at any time to make more or less extensive repairs to Machinery, as, owing to the great distance from any machine shops, we will have to be entirely self dependent. We also may be called on at any time to make repairs to visiting steamers. There also will be required one mason, one plumber and assistant, two or three roofers, one farmer for the terminal station at Wasspressni, to care for the station and mules and raise corn and fodder for the latter and keep a boarding house there for travellers.

There will also be wanted a pipe layer for the water works and sewers, and an electrician to set up the telephone and telegraph.

A cook and assistant will be required at both Patuca and Rita Tara or a boarding house keeper at the former place to take charge of the hotel.

There will also be required a man who can run a planer and jig saw and wood lathe.

Many of these men could combine several occupations in one. A man from North Carolina, who knows how to make tar, should also be brought. The captain of the Tug boat could also have command of the Snag boat up the river, as this work would not be undertaken until the jetties were done. When the snagging was completed he could take the river boat and his engineer accompany him.

LABORERS PLENTIFUL.

The laborers can all be obtained in the country. The Caribs are splendid boat men and fearless on the water. They and the Mosquito men and Zambos are also good loggers and rafters, having been accustomed to work cutting mahogany.

The number wanted will, of course, differ from time to time. In the logging work for the mill, there will be required one fireman, one cook, and three or four helpers in the mill, one driver, and five or six cutters.

On the tug boat there will be required one fireman and two deck hands. At the quarry camp, there will be required one cook, two strikers, and two handlers.

On the jetties there will be required for each gang, one fireman, two helpers on pile driver and four helpers to the carpenter, of whom two will be sawing off and two bolting, spiking and boring.

In the Bamboo log gang there will be required five or six men, who will cut and raft the bamboo and put it on the jetties. The men and team employed in the mill logging gang would be transferred up the river upon completion of the work of cutting and hauling logs for the mill, and be set to work cutting the piling.

At the brick yard will be required one cook and four men besides the boss. The lime burning will require one boss, one cook, two strikers and two handlers for a short time only. The tar making mill requires three or four men, for only a short time, including a cooper. The vegetable garden, two men for a short time and one man for the season.

Building the streets at Patuca, the water works, sewer and drainage will require about two dozen to three dozen men, if the works are all going on at the same time, and about one dozen on the wharf and buildings and 12 men and 6 pack mules on land survey, but as these works will not be undertaken until the jetties are built, the same men employed on them and the logging camps will be transferred to these works.

NUMBER OF MEN REQUIRED.

There will then be required about 60 common laborers and 40 mechanics and officers when the works are under full headway. The first expedition will require about 10 officers and mechanics, including General Manager, Assistant Engineer, Clerk, Captain and Engineer of tug boat, Doctor, Master Carpenter, two carpenters and mill man. All the mechanics and officers should be men who will purchase lands and become colonists.

TIME REQUIRED.

The first expedition will only have to lay out the part of the town nearest the wharf, so that the proper sites for the Quarters and store house can be determined, and erect these two buildings ready for the coming of the main expedition, which could be timed to arrive two weeks later.

When the main expedition arrives, all the energies will be devoted to getting out the lumber for the jetties. I estimate that six months will be required to set up the saw mill and cut the timber, get out the piling and bambco and prepare the iron.

With the lumber and piling all ready, the rock quarrying can easily keep up with the other part of the jetty construction, and I estimate that with two gangs working and no bad luck or accidents, destructive storms or strikes, etc., that the jetties can both be completed in nine months. There will then remain the Custom House, the Wharf, Water Works, Sewers, Streets, Land Surveying, etc.

These various works will occupy about a year and a half, making about three years to complete the works, leaving out the Toom Toom Dam and River Revetment at Patuca and improvements, if any are required, on the upper river.



SECOND PART.

FRUIT TRADE.

In this connection I have only space to mention a few facts in relation to this trade.

In 1877, fruit trade from Honduras begun with a little schooner. The same year S. Oteri, of New Orleans, put on first steamer, the E. B. Ward.

In 1880, 2 small steamers put on.

In 1880, Illinois Central R. R. hauled 143 cars of bananas from New Orleans.

In 1881, Illinois Central R. R. hauled from New Orleans 370 cars of bananas, each car containing 500 bunches.

In 1887, same R. R. hauled 3500 cars, 81 per cent. from Honduras.

In 1887, January to September (included) there were 136 cargoes, equal to 1,298,269 bunches, shipped from Honduras to New Orleans.

In 1888, Illinois Central R. R. hauled 4,300 cars, 74 per cent. from Honduras.

In 1888, 8 fruit steamers were running between the North Coast of Honduras and New Orleans per month, or 12 to all Central American ports.

In 1888, the Atlas line brought an average of 8 cargoes per month to New York. Some days as many as 10 car loads of bananas were shipped over the Pennsylvania R. R. from New York to the mining towns of Penn. Large quantities are shipped to Boston direct from Honduras. The largest vessels, like the "Breakwater," can now carry 30,000 bunches in layers.

In 1889, there were 3 lines of steamers, 16 vessels, making regular trips, each vessel carrying from 8000 to 15,000 bunches.

The business from the North Coast of Honduras amounted in 1899 to \$600,000, and it has continued to increase and has built up the following towns: Ceiba, Bonitillo, Juana Lopez, Piedra Pintata, Omanita, El Palmiras, Cofradia, Port Buchará,

Cienquita, Tulian, Puerto Tresagio, Progreso and several others. Ceiba was founded in 1880, and now has between 5,000 and 6,000 inhabitants, all attracted thither by the banana trade.

BLUEFIELDS CHANNEL, BUT ELEVEN FEET DEEP.

Bluefields, Nicaragua, in 1888 was only a miserable collection of cabins with about 1,000 inhabitants, all but about two dozen of which were Indians and Negroes. To-day it has 8,000 inhabitants with active merchants who buy great quantities of bananas. Banana planting was begun there in 1887, when I was in Nicaragua. The channel into Bluefields is but 11 feet deep. It is stated that 20 million bunches of bananas are imported yearly into the United States.

The following is the estimate of profits of banana planting as made by Dr. R. Fritzgartner, Ph. D., the late Government Geologist of Honduras and Director of the Mint.

Keeping clean the plantation 1st and 2nd year, at 5.00 pesos per cleaning, makes the total cost per manzana, 30.00 pesos, equal to \$12.60. 1st year's crop, 300 salable bunches. 2nd years' crop, 400 salable bunches, at 25 centavos, equals \$325.00, minus cost of cleaning, equals pesos, 295.00, equals \$123.90 American money per manzana, or \$71.62 per acre profit.

Two men will clear 1 manzana of heavily timbered land in 10 or 15 days. The brush is then burned and plants set out 5 yards apart; 1 man can plant 100 per day. It fruits in 10 to 12 months, large enough to ship, the fruit being shipped green. Common wages 50 to 75 centavos per day, or 21 to 31 cents (gold).

For 50 miles up the Patuca river the land on each side is rich and strong, and, above all, pre-eminently adapted to bananas. In fact no better land can be found anywhere for this fruit, and there are now 194 small banana plantations in bearing, belonging to the Indians, but they are of no value until the bar is opened, as it is impossible to ship them.

ADVANTAGES OF PATUCA HARBOR.

The harbor of Patuca will be the most protected and safest harbor on the North Coast of Honduras and, although small, in many respects the best. While Puerto Cortez is open to West and Northwest winds, and the heavy swells from the North roll in very unpleasantly in Northerers, so that in heavy

gales, with the wind from these quarters, schooners and small vessels have to haul out, Patuca is perfectly land locked and safe in any gale from any direction. The approaches from sea to the mouth of Patuca river are clear and unobstructed,



RUBBER TREE AMONG BANANAS.

and there are no reefs or shallows. There is good holding ground outside in 3 to 10 fathoms for 3 miles off the bar. The 100 fathom line is 20 miles off. The nearest shoal is 28 miles east by N. E.

Patuca, situated as it is on the North Coast of Honduras, is outside of the region of hurricanes. In the Standard Physical Atlas of Prof. Johnson is found a chronological table of the principal hurricanes that have occurred in the West Indies during the 162 years from 1675 to 1837, and during that time but one has touched the coast of Honduras.

HEALTH, TEMPERATURE AND RAINFALL.

In regard to health, I would respectfully refer you to my preliminary report. I have now lived 19 months in Honduras, and never enjoyed better health in my life, not having had, during the time, a single touch of fever or any other sickness. Three months of this time were spent on the north coast, during what is generally known as the sickly season, but I did not see or hear of any climatic sickness whatever, either among the natives or foreigners. From an experience of over four years' residence on the Mosquito Coast, in this State and the adjoining one of Nicaragua, I consider the reports as to their unhealthfulness to be gross exaggerations. I know from my own experience and my family's, and that of some 500 unacclimated white men from the United States, who composed my engineering and construction corps and general staff at headquarters on the Nicaragua Canal for over two years, that any person, male, female or child of good health and general constitution, no matter how delicately raised, can come from the North and live on the Mosquito Coast in perfect health, provided they take the least care of themselves, do not indulge to excess in intoxicating liquors, and do not build their houses and attempt to live in a swamp or land subject to periodic overflow. If, however, they violate all hygienic, sanitary and moral laws, they will incur the penalty of sickness in Honduras as well as elsewhere. In fact, the highlands of Honduras will yet be recognized as a sanitarium for all persons afflicted with consumption, catarrh or any bronchial affections, or who suffer from malarial or low coast fevers.

COMPARE WITH U. S. CITIES.

The death rate of Honduras in 1887 was 18.86 per 1,000, and in 1899, for the City of Tegucigalpa was but 14.04. For the Department of Colon it was (1887) 24.49, and for Olancho 19.53, which compare very favorably with any cities in the

States, and this with the total lack of all sanitary arrangements for which all Spanish-American cities are notorious.

TEMPERATURE.

The temperature of different places in Honduras varies greatly, the low coast lands being hot, while the higher lands of the interior are colder, in proportion to their elevation above the sea, until on some of the high mountain peaks frost is experienced in winter. Temperature falls one degree F. for every 288 feet of elevation. The following thermometrical readings were taken by Mr. Thomas Young, at the mouth of the River Negro, 14 miles west of Patuca. They were taken daily at the middle of the day, for one year. Although these were taken several years ago, the climate has not changed.

Fahrenheit.		Prevailing winds.	Ruling climate.
Month.	Mean. Temp.		
Jan.	62 to 66	North and West	Good, when there is a dry norther.
Feb.	66 to 70		
Mar.	70 to 74	Variable between breezes and N. E.	Dry.
Apr.	74 to 76	N. E. and breezes.	(Narrative of a residence on the Mosquito Coast, etc., by Thomas Young, London, 1847.)
May	78	Strong breezes N. E.	
June	78 to 82		
July	82		Damp.
Aug.	84 to 86	Light and variable airs and calms.	Dry.
Sept.	84 to 86		
Oct.	78	Breezes, some light northers.	Dry or damp, according to the wind.
Nov.	72 & less	North.	Damp, good weather when there is a dry norther.
Dec.	62 to 66		Damp.
Mean 74.17 75.75			

"Notes: The climate here is equable, only varying during the year from 62 to 86 Fahrenheit, so they never have excessive heat, as the greater part of the year is tempered by agreeable

sea breezes and some times by the cooling dry northers."

The following observations were made in the vicinity of Carataska Lagoon, about 35 miles east of Patuca, by an illustrious Prussian Commission composed of Messrs. Müller, Jellechner and Hese, between the 13th of June and the 2nd of Augut, 1844.

Fahrenheit.

Time of day Temperature.

6 A. M. 78.5 During this time the wind blew constantly from E.

11 " " 83.1 E., N., E. or N. E. with the exception

3 P. M. 83.4 of 3 days in June from the S. W. and one day

7 P. M. 82. in July from the N. W.

Minimum of temperature was 61 on July 2nd.

Maximum of temperature was 85 on July 4th.

At the mouth of the Patuca river I caused thermometer readings to be taken from September 14th to 28th.

The highest observed was 90 at 1 P. M., Sept. 25th, and

The lowest observed was 76 at 7 A. M., Sept. 20th.

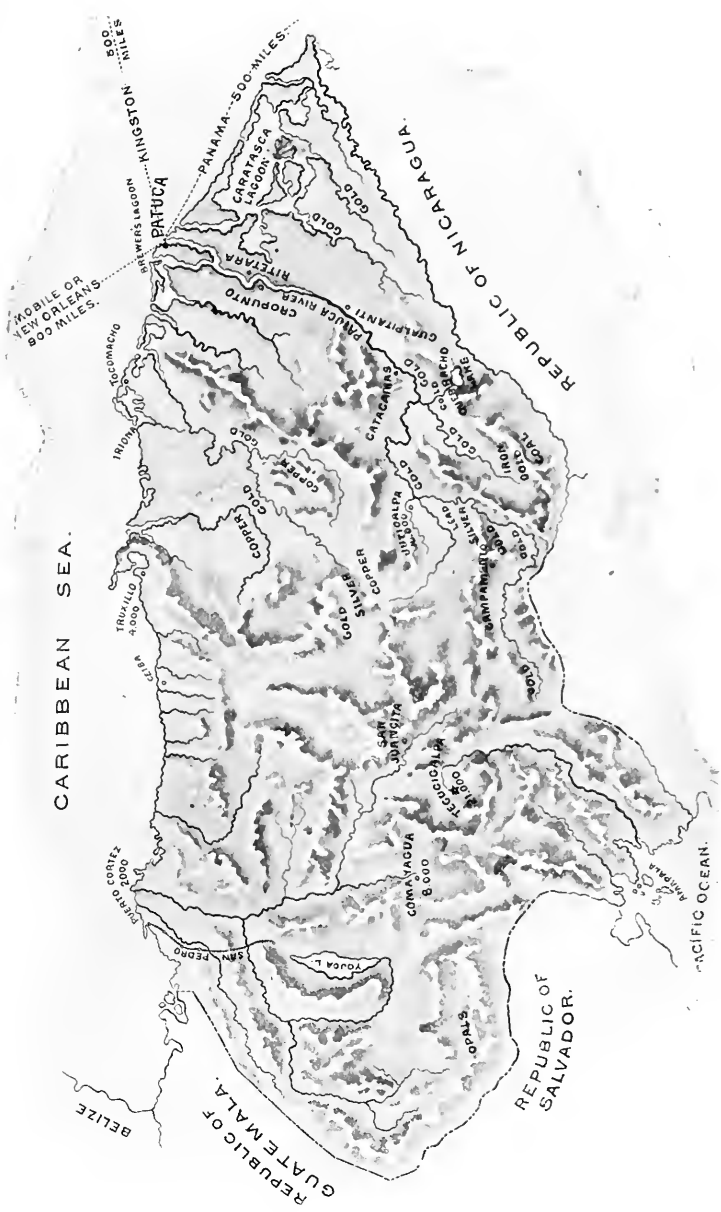
The mean of 14 observations between the 14th and 28th was 86½.

During this time the prevailing wind was from the E. and S. E., with light land breezes from the S. W. and calms in the forenoon, with showers at night.

Some of the lands in the Grant to your Company have an elevation of 3,000 to 4,000 feet above the sea, and in this elevated region it will be desirable to establish our hospital. This may be on the slopes of Sugar Loaf Mountain, Poyas Peak, or in the Colon Mountains, and a plantation should be made there by the Company, or some person connected with it, which would serve as a Sanitarium for persons living on the low lands and would afford a desirable retreat in the hot months, which could be reached in a day or day and a half.

RAINFALL.

Information on this point is very meagre. I cannot find that any record of rainfall has been kept in Spanish Honduras except in Comayagua, by Mr. E. P. Maves, an English civil engineer, and also a report from San Pedro Sula. He reports as follows:



Comayagua Minimum 42 inches, per year.
" Maximum 132 " " "
" from 7 P. M. to 11 A. M. on one night in August, 1899, there was a fall of 36 inches.

San Pedro Sula, 1895, 230 inches.

It is stated, by the Government Geologist, Dr. R. Fritzgartner, that the mean rainfall of the whole of Honduras is a little over 90 inches per year.

The rainy season, called winter (*invierno*), commences in May and lasts until November.

The dry season, called summer (*verano*), begins in November and lasts until May.

The rainfall of a country bears a direct relation to its agriculture, its transportation, its sanitary condition, and to all studies for water supply, electric lighting, drainage, sewerage, river navigation and hydraulic works. For this reason I would recommend that a careful record be kept at Patuca and also at our up river stations.

GAME AND FISH.

These are so abundant that they will form a ready, cheap and stable food supply to our workmen. For this purpose two large drag seines, 150 and 300 feet long each, should be supplied for use at Patuca bar. On the upper part of the river in Olancho, deer are so abundant that some of the mining camps there employ a hunter, who brings in regularly a deer every day, and sometimes two and three. Wild musk hogs and Mexican peccary, excellent eating, are also abundant. Tapirs, weighing 800 to 1,200 lbs. each, are so abundant along the river as far up as I went, that no matter where a person landed the soft ground would be found trodden into paths and with their tracks as numerous as cow tracks in a cattle pen. The flesh is excellent. I shot three of these animals in Nicaragua. Deer abound on the savannas and pine lands.

Wild turkey of three varieties, quail, ducks, four kinds of pigeons and doves, curlew, snipe and grouse abound. Also armadillos, raccoons, opossums, Indian rabbit or agouti, an animal resembling a rabbit, but with hoofs and short ears, the common rabbit, the jibeonita, much esteemed for food, and lastly the manatee or sea cow, weighing 600 to 1,000 lbs., and excellent eating.

There are no bears. There are also a great quantity of sea and fresh water turtles, the former being the celebrated green

turtles, and they lay their eggs on the Patuca beach and adjoining cays in great numbers, which are highly esteemed for food. It will be much better to employ a hunter and live on fresh game, rather than to invite scurvy by eating salted and preserved meats.

LANDS OF THE GRANT.

100,000 HECTARES—247,100 ACRES.

In regard to the lands granted to your Company, but little definite and detailed information can be given at this time until more thoroughly explored. All the histories of the country, the report of the last census, and accounts of travelers, hunters, cattle-men and surveyors agree that this is, by far, the richest part of Honduras, although at present almost a *terra incognita*.

Squires, in his book on Central America, says that "the geography of the lower Patuca river is the richest and most beautiful in Central America."

In a report made by Haly, Upton and Deacon in 1884, they say that "the savannas along this river are not swampy like those of the coast and they have a black and fertile soil." The land is of great variety, all admirably adapted for the cultivation of sugar-cane, cacao (chocolate), coffee, cotton and indigo. There are immense quantities of mahogany, cedar, rosewood and Santa Maria, and there is found throughout the valley inexhaustible quantities of good pine and oak and abundance of sarsaparilla, rubber, copal and vanilla." This is all true to-day. They think that "an establishment at the mouth, sustained by navigation on the river and roads to the interior, will be in a short time the most important on the coast."

My own limited observations bear out these assertions.

The land, generally speaking, all along this part of the coast, is low and swampy and undesirable for the most part. This is succeeded by rolling hard pine lands, soil brown or chocolate in color, gravelly and poor on the tops of the hills, but rich and fertile in the little swales and valleys, with clear little brooks coursing through them, and all eminently adapted for the raising of pineapples, oranges, lemons, mangoes, sweet potatoes, garden truck, cotton and tobacco. These pine lands alternate with wide level savannas, dotted with groves of palms, and these in turn by the foot hills and valleys that are succeeded in places by high mountains, the slopes of which

are clothed with hard wood and white pine and cedar, between which lay long rich valleys dotted with trees of different kinds.

"The pine and savanna land is about 20 to 25 miles wide from the sea to the foot hills, which are clothed with virgin forest. This pine land is excellent farming and grazing land."—(Mayes.)

TIMBER.

The country lying between the Patuca River and the Nicaragua boundary is almost unknown and is only inhabited by Indians of the Toaca tribe, except on the immediate coast, where dwell the Caribs and Zambos. The streams running into Carataska and Brewer's Lagoons have been ascended and are reported to contain large quantities of mahogany on their banks. The same is true of the affluents of the Patuca on both sides. All the mountain slopes are reported to abound in mahogany and cedar, some of the latter reaching 20 feet in diameter as I am credibly informed by Mr. E. P. Mayes, a civil engineer of long residence and extensive travel in this country. Indians of the Poyas tribe, part of the great ancient nation of Nicaques, live on the left or west side of the Patuca, up to the Rio Negro and the land is rich and well timbered. There is but little hard pine on this side of the river, the larger part of this timber being found between the Patuca and Carataska Lagoon.

At the vicinity of Gualpitanti the valley or water shed of the Patuca is about 30 miles wide and going up it soon grows narrower. Below this point I am unable to state the width, as the forests were so dense it was impossible to determine it at any point, without stopping and making an excursion on one side, which I did not have the time at my disposal to undertake.

LENGTH OF RIVER.

At the 8 kilometer limit I should judge that it might be 15 to 10 miles wide, and all the richest and most desirable land for bananas and sugar cane that can be found in the world. In some places the valley is over 50 miles wide.

The Patuca River, which rises in the mountains of Tegucigalpa, flows through the center of your grant for a distance estimated at 150 miles by the river and has numerous tributaries. Mr. E. P. Mayes, civil engineer, tells me he went up

180 miles in a launch drawing two feet, at a mean stage of the river, with a party of English naval officers, making a compass reconnaissance of the river.

It takes its name from a chief of the Poya Indians called Butuco, whose headquarters were at the mouth of the river, where the present town is. The English corrupted it into



BANANA PLANTS SIX MONTHS OLD.

Patook, and the Spanish made it Patuca. There are nine Indian villages on the Patuca River, including the one at the mouth, which latter is mostly composed of Zambos and Negroes from Belize. Those up the river are Poyas and Toacas. The villages are all on the right bank, except Patuca and Sikia Pijini, as described in my preliminary report, and

their names, commencing with Patuca, are: Ulan, Cropunto (Shrimp Point), Duchan, Habas-Duchan, Gualpitanti, Anjia Pijini, Wanke Bila and Sikia Pijini.

Ines Navarro, an assistant editor of "The Pabellon," a newspaper of Tegucigalpa, writing in the issue of August 12th, 1899, says:

"For the commercial development of the country the rivers of the Mosquito territory are of immense value. Above all of them, the Patuca is the first, from this point of view, of the Atlantic coast, after the San Juan of Nicaragua. It is an ornament of nature in Olancho and will carry in time, the immense productions of this, the richest zone, to the waters of the Atlantic.

"According to the illustrious Squiers its watershed is the richest in Central America.

"According to Senator Senor Melquizedec Zuliga Echenique, who explored it in the year 1897, by order of the Government of Honduras, it always preserves, at the lowest stage, except at the mouth, from 6 to 8 feet of water, up to where the wide Guayambre enters it. Pasqual Cano, a merchant of Catacamas, has purchased merchandise on the coast and brought it up in boats to within $2\frac{1}{2}$ leagues from that city. Every day the principal men of Olancho are pledging themselves to convert it into a great water way for their commerce. The navigation of the Patuca, however, is not only of interest to this department, but it is of national interest."

Going up the river from Patuca village the first tributary is Black Creek on the right bank (left going up). This is a deep and sluggish flowing fresh water creek, about 80 to 100 feet wide, and the color of its waters indicate that it rises and flows through swamps. It is said, at high water, that a canoe can pass via this creek into Carataska Lagoon. At $24\frac{1}{2}$ miles we come to Toom Toom Creek or the "Cut-off," which flows out of the Patuca River on the west side and forms a pass to Brewer's Lagoon, discharging nearly $\frac{1}{3}$ of the water that would otherwise pass by Patuca village.

About $6\frac{1}{2}$ miles above Toom Toom Pass we come to the Upurra Creek, "river of the retreat," also called Kipany Creek, about 15 miles long, flowing in from the west side. We then pass two creeks flowing in from the east side and about 15 and 10 miles long each. One of these is known as the Rio Aryas, about $14\frac{1}{2}$ miles above the Upurra, the other the Kankirira. This and the former head in the foot hills.

The Indian town of Gualpitanti is according to my recon-

naissance about 75 miles by the river from the sea, or about 45 miles direct, and $\frac{3}{4}$ of a mile above this, the Gualpitanti Creek comes in from the east side. This creek is said to be about 9 or 10 miles long and its mouth is just at the base of the foot hills.

The next is the Cayamel or Cuyamel on the west, 9 miles above the Huampu or Vampu, and 10 miles long.

The next stream shown on the map is the Guineo or Banana River, with two large branches, which empties into the Patuca from the east, on the division line between the department of Olancho and the Comarca or territory of Mosquitia, and which is 28 miles long and heads in the Colon Mountains, which are the eastern extension of the Tomposenta Mountains, about 15 miles from the river Coco or Wanks, which forms the boundary between Honduras and Nicaragua.

Between the river Guineo and the Wasspressni are two (2) small towns, Caoba and Campamento, on the east bank, and just above, where the road from Catacamas strikes the river, in the village of Campanero, all in our grant.

Between these last named rivers, two other unnamed streams—about 10 to 15 miles long—enter from the west, heading in the eastern part of the Juticalpa Mountains.

The next stream coming in from the west is the Wasspressni (roaring water), about 15 miles long. A short distance above the mouth of this river the road from Catacamas strikes Patuca River, between Campamento and Culmi, where our navigation line ends, and the concession to Howland begins, which extends to the Portal del Infierno (Hell Gate), a distance of about 32 miles direct and 56 by bends of river according to Mr. Robert Cleaves, mining engineer, who lately returned from a reconnaissance of it. The Patuca River, a short distance above this point, is formed by the confluence of the Guayape and the Guayambre rivers and the Jalan, all gold bearing streams, from 40 to 120 miles long. All these affluents of the Patuca in the mountains and foot hills are gold bearing.

Your concession is also watered in the west by the rivers Agalta, 120 miles long, and Paulaya, 21 miles, and other branches of the Rio Negro. Also by the Guamaca, 15 miles long, which empties into Ebon Lagoon near the eastern end, Platano or Plantain, 85 miles long, emptying into the ocean 5 miles west of Brewer's Lagoon, and by the Secre or Sigri, 45 miles long, and the Truscrua or Canas River, about 20 miles long, both of which debouch into Brewer's Lagoon,

called Cartina by the Indians and Brus by the Spaniards. The lands bordering Brewer's Lagoon, are low and flat on the south and east, being great selvas or grass savannas, with occasional ponds of fresh water, merging gradually into flat pine land, the long leaved hard yellow pine, excellent grazing land. At the south-west corner of the lagoon the land appears higher.

In Brewer's Lagoon are three small islands; the largest about two miles in circumference, now called Cannon Island, was fortified by the English and was also headquarters of some of the buccaneers that infested these seas in the early part of the last century. This island is about 100 or 125 feet high, and on the seaward summit I found three old iron cannon (6 pounders) with their wooden carriages almost completely decayed. There are good oysters in the lagoon and great quantities of fish and wild fowl. It is at this island we will get our rock for the jetties, as explained in my preliminary report. There are about 50 people living in the two Indian villages on the lagoon. One village is called Brewers and the other Ben.

LEMONS.

Roberts says "the country towards the south is beautiful and varied by high range of hills, valleys and savannas and the soil, generally speaking, is excellent. There is from 6 to 7 feet of water on the (lagoon) bar." The Rio Negro empties into Ebon Lagoon, which is about 15 miles long and 6 wide, and 6 miles west of Brewer's Lagoon. The lagoon contains several small islands, which were cultivated by the English. The Carib village of Tocomacho is situated at the western end of Ebon lagoon, sometimes called Criba, or Rio Negro Lagoon. The Carib town of Criba is at the eastern end. It is said that the creeks and lagoons form almost a continuous water communication from Caratasca lagoon to Tocomacho. On the Rio Negro, near Ebon lagoon, Mr. Allen Brunner, of Chicago, has a large lemon grove. I was presented with some of these lemons when on that coast last autumn and found them to be a very superior class of fruit; large, thin skinned, few seeded and full of juice. The grove is situated on pine land, with high pine trees similar to that already described and very beautiful, as if arranged by a skillful gardener.

This is only 8 miles from sugar loaf or Panoche Peak,

around the eastern base of which flows the Rio Negro. Young says, "the upper part of the river flows through very rich land and the climate is healthy."

The English many years ago had a settlement 16 miles up the river, near a place called the Mountains of Lowry, which



BARRACODA, FIVE FEET LONG, CAUGHT AT SEA, OFF PATUCA.

was abandoned by treaty with Spain in 1787. Subsequently it was the seat of the Ioyas nation of Indians. In 1839 and 1841 it was again occupied by the English, who called the district Victoria Province. The fort was called "Fort Well-

ington." The current of the river is strong. Mr. Thomas Young, previously quoted, says: "Coming down the river is low, but the lands are rich and covered with wood and varied with bamboo and palms. A little lower down are swamps full of willows. The savannas commence where the river enters the Criba lagoon. This land is sterile and unfit for cultivation, but covered with a multitude of deer."

Columbus entered the mouth of this river on his 4th voyage in 1502 and took possession of the country. In 1742 the English built a fort here, the remains of which are still visible. They evacuated in 1786. Columbus called it "River of the Possession." It was later called Rio Tinto. It is navigable from 40 to 70 miles and has from 5 to 9 feet of water on the bar. The river is also known as the Payer, Palyer, Payas, Black, Cico, Grande, Agalta and Poyas. It is 120 miles long and there are about 9 small villages inhabited by Poya Indians and a few Spanish. The land on this river is described as very fertile.

That part of your grant lying to the eastward of the Patuca is watered by the following rivers: The Tibacunta or Tabocunta, about 22 miles long, which empties into the Carribean Sea about half way between the mouth of the Patuca River and Carataska Lagoon, flowing out of the western end of said lagoon.

According to the best maps that I can obtain, the following rivers that water your grant flow into Carataska lagoon, or its connecting lakes or lagoons, beginning with the most western and going east: The Guarunto, variously given as 75 to 50 miles long, which flows into Guarunto lagoon, connecting with Carataska; the Gibentara, 65 miles long, flowing into Gibentara lagoon; the Locca, 18 miles long, flowing into Gibentara lagoon; the Guaranta or Guarunto, flowing into the same, and variously stated as 17 or 55 miles long; the Caucari, 21 miles long, flowing into the same; the Croats, Croatch or Grarach, one branch of which flows into the Carribean Sea at Cape False and another into Caratasca Loch, and the Tiburcana, 27 miles long, flowing into the sea between Cape False and Cape Gracias a Dios.

Carataska lagoon, in the Zambo tongue Caratasva, or great alligator, is 35 to 37 miles long and 10 to 12 miles wide, counting Gibentara and Guarunto lagoons, which form part of it, separated by numerous islands covered with pines. The depth on the bar is 12 to 14 feet, and it is said to be a good harbor, inside, with from 6 to 12 and 18 feet of water. Di-

rectly west of Carataska lagoon, or Cartago, and connecting with it by a short passage, lies Tilbalacca Lake, from 5 to 10 miles in diameter, and 3 to 5 miles east of the Patuca River at Crupunto. This lake has several small tributaries.

ACCOUNT of the BRITISH ESTABLISHMENTS in CENTRAL AMERICA, LONDON, 1811.

Captain Henderson, commander of the garrison of Belize, describes the country in the vicinity of the lagoon, as "a spacious savanna, completely level, covered with verdure and a good pasturage, bounded on one side by the waters of the lagoon and on the other by a high chain of hills. The hemispherical tops of the pines and high trees, gracefully spaced, give an agreeable vista and appearance of artificial cultivation, presenting a beautiful relief."

ACCOUNT OF TRAVELS in the EAST COAST AND INTERIOR OF CENTRAL AMERICA.

BY OLANDO W. ROBERTS, EDINBURGH, 1827.

Roberts says, "the lands adjoining the lagoon are for the greater part beautiful savannas covered with good pasturage and a great many deer. They have some pines in the lagoon of Carataska and towards the south there are hills full of woods of construction as much as in any part of the coast. Back of these the savannas are crossed by high range of hills, whose summits are covered with a most exuberant vegetation. On the margins of the rivers that flow from the interior, there is excellent mahogany and cedar of the best quality and largest size. Pepper and various other valuable indigenous plants are also found."

Apuntamientos sobre Centro America por E. G. Squier, Diplomatico de los Estados Unidos, Paris, 1856.

FORESTS OF PINE.

Mr. Percy B. Keene, an English merchant of Perspire, Honduras, who has lived a dozen years in Honduras and Nicaragua and has traveled all over the North Coast and to the rivers, Patuca and Negro, tells me that "between the Patuca and Tabacunta a beautiful cocotal, or pine ridge, comes down to the shore of the sea," and he describes it as a desirable country for settlement and colonization and that there are a

great many cocotals, or cocoanut groves, around Carataska lagoon, on the sea side near the numerous Carib and Zambo villages, of which there are four, viz: Ouhe, Carta or Cartago, Orabella or Yarria Bila, and Cowcara or Contoon. He says, "there is plenty of mahogany on the streams emptying into the lagoon and also on the Negro river and branches and that the whole Patuca valley is eminently adapted for the cultivation of rubber and bananas."

GEOLOGY AND FORESTS.

Mr. E. P. Mayes, a well known civil engineer of Honduras, formerly from England, informed me that he once made a survey from the Nicaragua boundary to the Patuca River, about five miles from the sea, and he reports, "the land is flat, rich savanna and selvas or grass land, alternating with low rounded hills, covered with hard yellow pine, the tops of the hills gravelly, while the bottoms are rich soil and all very desirable for haciendas and plantations.

"The savannas and pine land extend inland about 30 miles from the sea and are succeeded by the foothills clothed with the primeval forest. The country is not generally much broken in the foot hills, but there are large plateaus nearly level, but cut by numerous arroyas or swift running streams and crossed by ranges of hills, which gradually merge into mountains, some 4,000 feet high. These mountains are composed largely of white mountain limestone of the lower carboniferous, overlying micascists and lower down occurs marble and quartzose conglomerate and Permian magnesian limestones. These elevated lands cannot be excelled for coffee, wheat, Irish potatoes, cacao (chocolate) etc., etc."

This whole region is a *terra incognita*.

The southeastern boundary of your grant is the large river, variously known as the Wanks, Coco, Segovia, Herbias, Yare, Cabo and Oro, which separates Honduras from the Republic of Nicaragua.

This river is 205 miles long, measuring its general course, and about 300 by the bends, and has numerous short tributaries on the Honduras side, which irrigate your grant. The first of these, ascending the stream, is the Livings Creek, which is a cut-off or pass, leaving the main river on the west side, 10 miles above the mouth and forming two other mouths in the sea, about 9 miles and 8 miles west of the main mouth, respectively. We then come, 36 miles up, to the Somote, a

creek about 10 miles long, coming in from the west. About 45 miles up, by the general direction of the river, from the same side comes in the river Comali, formed of several branches, and about 21 miles long, heading in the northern end of the Colon Mountains. We then pass two short streams, names unknown, running down from the same mountains, and at 71 miles we find the Ticaro, about 11 miles long, with two branches of nearly equal length. At 75 miles the Sole-tetinge River comes in from your grant about 8 miles long, and at 95 miles, the Cujume, 15 miles long.

The first rapids, called Wutwas, Tirlas and Quipisque rapids, are met at 106 miles, by the general course of the stream, which would be about 150 or 175 by the bends of the river.

There are several other unnamed streams of about the same length. All of these head in the Colon Mountains, which range runs parallel with the general course of the Wanks River, and the summits about 15 miles north-west from the river and in your grant, unless upon examination it should be found undesirable land, and you should prefer to take land elsewhere.

The Wanks river takes its rise only 80 miles from the Bay of Fonseca, on the Pacific, and empties into the Caribbean Sea at Cape Gracias a Dios. It has a bad bar with only 4 or 5 feet of water, probably owing to the fact that the river forms a delta with four mouths. It is navigable for boats drawing 2 feet, 100 miles by the river from the mouth. It is very likely that the bar at the mouth of the river could be improved by closing all but one pass. There is an Indian town (Mosquitos and Zambos) at the mouth on the extreme end of the Cape, on Honduras side, called Klakechava or Haya and a white settlement called Cape Gracias just below the Cape, in Nicaragua. There are some 20 Indian villages on the north side of the river, within the limits of your grant, inhabited by tribes of Mosquitos and Waikas. These Indians are straight and small in stature; dark, thin lipped, oval faces, aquiline noses and long, stiff, coarse jet black hair, that hangs to their shoulders on the men and is braided in a cue by the women.

When I was the engineer in charge and general superintendent of the Nicaragua Canal in 1888-9 and '90, I sent up and procured about 300 of these men to work on the Canal and found them good workmen—tractable, willing and industrious, although not so strong as larger races.

They raise quantities of plantains and bananas on the river.

Above the head of Livings Creek and extending 30 miles from the main river mouth, there are several lagoons, on the Honduras side in your grant, connecting with the river and a large salt-water one just below in the bight of the Cape.

60 miles up and extending for 10 miles more, are found several others, in your grant. The foot hills begin about 80 miles up the river, the Prairies of Ocotal, or Pine Prairies, reaching that distance here, from the coast, but a short distance north of the river on the Honduran side, the foot hills begin at 30 miles from the coast.

De Lussan, one of the chiefs of a party of French and English pirates, who descended the Wanks River in 1688, coming from the Gulf of Fonseca, described the river as having "a long and rapid course by a vast number of rocks of prodigious size and over the most frightful precipices that can be considered as cascades, and which are not less than 100. It is impossible for a man not to tremble and lose his head to see and hear the fall of the water into these profound abysses."

Many of the party were drowned. He also speaks of the "abundance of bananas growing on the margin of the river and abundance of game." He says, "the part of the river below the rapids is very good."

Diario de un viaje etc. por el Senor Raveneau de Lussan. Londres, 1704.

Don Francisco Irias of Honduras, who descended it, returned in 1842, says "it abounds in fish and the forests on the margins are rich in precious woods. All the country, below the rapids, through which the river passes is of extraordinary beauty, consisting of open plains covered with grass and scattering pine trees, that appear to be the same as those of North Carolina.

"It is proper for pasturing cattle and will sustain a great number, and for the establishment of colonies, which in a short time will acquire rich properties by cultivating the virgin soil.

"The Indians on the river have small plantations of plantains, yucca, cane and cotton, and from the latter the women make cloth and sails for their canoes. The climate at the Cape and all the river valley is healthy. Cape Gracias a Dios has a favorable and picturesque situation, and the section surrounding the Cape is beautiful."

Roberts, before quoted, who passed several months at Cape Gracias a Dios, says regarding the soil, that "in the vicinity

of the Cape it is poor, and with the exception of a few patches of cassava, is incapable of producing anything but coarse grass, which, however, serves for pasturage. The animals of the chase are insignificant, and there is a great scarcity of good water, so that the Cape presents no advantages for agriculture, although they can raise cattle. The river enters the ocean a short distance to the north of the bay, with which it is connected by a channel, navigable for canoes and which avoids the dangerous bar."

Columbus discovered this river on September 14th, 1502, on his 4th voyage. He called it the River Disaster, because some of his sailors drowned here, from one of his ship's boats, that attempted to cross the bar.

"For 40 to 50 miles from the mouth," continues Roberts, "the land is low, sandy and poor, with some pine hills having intervals of good land."

The following is copied from a "Memoir of the Mosquito Coast, written by the Council of State of Jamaica and transmitted to the Tribunal of Commerce and Agriculture in 1773."

"The climate of the Mosquito Coast is more agreeable than any of the West Indian Islands and the air is more salubrious, the land is well watered and excessively fertile. It is of the highest grade of richness. It presents everywhere not only the means of providing the necessities, but also living with luxury.

"Fish abound in the rivers, lagoons and sea, and great quantities of turtle are found on the coast, in such numbers that the like are not found in an equal length of coast anywhere else in the world. Cotton, cacao (chocolate) and vanilla flourishes in all the country. Indigo is native and appears to be the same that is produced in Guatemala, which is esteemed the best. Sugar cane grows better than in any of the islands and mahogany and sarsaparilla is exported annually in such large quantity that it makes this establishment already of the greatest importance to Great Britain; 800,000 feet of the first and 200,000 pounds of the second, with 10,000 pounds of turtle meat, were shipped to England in 1769. There is more Campeche wood (dye wood) on the margins of the rivers and lakes than in any other part of Honduras."

Turtles abound there to-day and great quantities of valuable turtle-shell is gathered.

Mr. A. J. Miller, writing in the "Honduras Progress," described some extensive ruins of a stone city about 2 miles square on the Guampoo or Vampu River, 10 miles from its

mouth, partly surrounded by a wall and containing many very interesting sculptures with carving of heads of animals and hieroglyphics. Mr. W. W. Packer also reports ("Honduras Progress" Aug. 22, 1889.) finding ruins on a hill in the same region, probably the same as above described. He says, that there are also ruins on the Cuyumel and Wasspressni rivers, with obelisks, paved streets, hieroglyphics, etc., on a small tributary of the Cuyumel. Also stone walls and earthworks near the little village of El Patasti near Catacamas. All these ruins, with the possible exception of the latter, are comprised within the limits of your grant. In some similar prehistoric ruins in Guatemala, large amounts of treasure have been found.

MINERALS.

(In Olancho and Colon only.) Regarding the mineral riches of your grant absolutely nothing is known for want of even the most cursory examination. Marble, coal and oil are found on the north coast in several places and in apparently the same geological formations. The greater part of the stratified formations belong to the Permian, which overlies the carboniferous formation. Both of these horizons are known to contain coal. The Permian group is famous for its large yield of silver in Mexico, Germany and Russia.

Across the line in Nicaragua in what appears to be the same geological horizon, extensive and rich gold placers and quartz veins have been discovered and are now being extensively worked and judging from the reports that have reached me, in a very profitable manner. I heard wonderful stories of these rich diggings when in Patuca last fall and from other people from Nicaragua.

Very nearly half of your concession lies in the Department of Olancho, the larger half being in the Department of Mosquitia. The headquarters of the Patuca River and all its tributaries in Olancho are famous for their gold deposits and have been for 350 years. From time immemorial the Indians of all the surrounding country have resorted to the Guayape, the Guayambre and the Jalan, to wash for gold, and they still continue to do so. Wonderful but well substantiated accounts are given of the marvellous finds in the early days of the Spanish possession.

The large and costly cathedrals, built of stone and cement, were, as the old Spanish padres inform us, built almost en-

tirely by the contributions of the Indian women, who washed the gold from the beds of the streams. Murcielago and Aleman, on the Guayape River, about 20 miles S. S. W. from Juticalpa, are famous localities.

In 1853 the Indian women and boys washed \$120,000 gold from the Guayape.



NATIVE WOMAN WITH BANANAS.

Dr. Charles Dorat, who visited this district in 1853, says: "Apuntamientos sobre Centro America por E. G. Squier, Paris, 1856."

"Among the rivers of Olancho, which we have visited and

examined, the Guayape and the Jalan are without any doubt the richest in their auriferous sands. We find gold in the alluvial deposits, half a mile from the channel of the river. Leaving Juticalpa in a northwest direction and crossing the department to near Jocon in an area of 20 leagues in length and 10 in width, there is not a rivulet, however insignificant it may be, that does not contain gold in its sands and in its margins. The greater part of these streams issue from the mountains and fall in the Guayape and Jalan.

"There are some, among them the rivers Sisaca and Mangulili (the last with more gold than the others), that unite to form the Mirajoco, which then takes the name of Taguale, and after having fertilized the beautiful valley of Olancho, disembogues in the sea near Truxillo.

"In this river they find the gold deposited under the river bed. The best gold is that of the Guayape, Jalan and Mangulili, in the department of Olancho, and the Sulaco, Caimito and Pacaya in Yoro.

"In Guijana they find gold in a soft rock and in San Felipe in a reddish ferruginous earth. About 5 miles from Danli the Jalan produces it good and abundant."

The mining operations, so far, have been mostly carried on, on the upper Patuca River, here called *Guayape*, in a territory from 10 to 12 miles above your grant, to 100 miles, and about 60 miles wide.

In the Department of Olancho in 1887-8-9, there were 27 gold and 1 silver mine denounced.

In 1888 there were 27 gold mines and prospects near Vijao. A placer claim is 1,000 hectares and a fissure claim 600 lineal metres by 200 metres measured at right angles, according to inclination of vein. In 1892 there were 40,000 ounces of gold exported from Honduras, most of which came from Olancho and Yoro. This is probably only a small part of what was really carried out, as innumerable cases would undoubtedly occur that were never reported. In 1888 the mines of Honduras produced \$2,000,000. In 1826 the director of the mint of Guatemala reported that 2,000 veins carrying gold and silver had been discovered in Honduras, which the Government Geologist thinks is an under estimate. * * *

The section east of Zapilote opposite San Felipe is highly mineral. Nearly all the tributaries of the Guayape and Jalan, east of Vijao, Rucio and Retiro carry gold and the mountains and hills in vicinity. In Ussilili Mountains, west of San Felipe, are enormous deposits of conglomerate carrying gold.

The Jalan River runs through it. There is a valuable mineral region south of the Cockerton Concession and Olancho Syndicate and west of Hodding's large quartz outcrops.

All the tributaries of the Jalan carry coarse gold and natives come from long distances to wash for gold in them and the Jalan itself, where large nuggets have been found. From Canales to Le Frio they find from 20 to 100 coarse colors to a pan. Nearly all tributaries of the Guayape, between posts 36 and 51 of the Olancho Exploring Company, now controlled by Major E. A. Burke, carry gold.

A scientific commission appointed by the French Government recently reported officially to M. Honotaux, minister of foreign affairs, that "there was in their opinion gold enough in these properties to pay the national debt of France."

Roberts, E. M., reported 50 to 60c. gold per cubic yard on the Guayape. Hicks and Monahan, miners, 1886, say women are making from 50c. to \$1.00 and \$2.00 per cubic yard. One place \$10.00 per yard. Henry Woolcock, E. M., reports 10 to 700 colors to the pan, and bed rock gravel \$15.00 per ton. On the Quebrada Grande and Agua Maria, affluents of the Guayape, Mr. H. C. Barnhart and Mr. Geo. Stanley Rees, C. E., and architect, obtained \$8 per cubic yard.

"At Murcielago Bank a woman washed in my presence 6 pans and obtained about \$1.00 value of gold dust.

"Some banks I have personally tested and the gravel streak is from 2 to 4 feet thick under 20 feet of surface earth, which also has occasionally a gravel streak or two. The lower gravel runs from 80c. to \$1.00 per cubic yard and the top earth from 10c. to 20c. per cubic yard."—E. P. Mayes, C. E. * * *

"On the Quebrada Grande (tributary of the Guayape) I saw 4 women obtain in three hours 16 dwt. of gold."—Byrne.

"Near Retiro I estimate the gravel in the river to be worth 75c. per cubic yard, which I am satisfied is an under estimate. The women wash 25 to 50c. in pans in 3 to 4 hours. A woman's day's work is 15 to 20 'bateas,' or pans of dirt, and invariably they go home with 25c. to \$1.00 worth of gold. It takes 104 'bateas' to one cubic yard. Bed rock of that river has never been seen by anybody. There is no doubt in my mind that when we reach it we will get as high and higher than \$50.00 per pan."—Douglas L. V. Browne, M. E.

Table of assay of ore per ton of 3,000 lbs. from quartz veins on the Jalan River, by A. T. Byrne, C. E. M. E.

Locality.	Gold.	Silver.
Garcia	\$50.32	Trace.
España 1.....	137.19	\$3.43
España 2.....	2,749.85	9.00
Espana 3.....	801.12	....
Grande 1 } Telluric	12,800.00	320.00
Grande 2 }	1,894.00	15.00
Grande 3.....	92.91	23.00
Retiro Viejo	371.60	30.12
Retiro Viejo	152.00	54.30
Retiro Viejo	83.42	31.90
Retiro Viejo	558.27	13.24
Zelipatepec (Zolipatepec)	81.52	10.20
Minas de Oro	108.36	63.45
Oro Memudo	241.03	19.13
Oro Memudo	66.78	2.19

"Los Coralitos, a principal branch, is being washed by women, who are taking up 50c. to \$1.00 per day." (Certificate of town authorities of Guaimaca).

"I prospected bars in the Jalan and obtained 20 to 40 colors to a pan and even 300. Width, 100 yards to 500 in places.

"At Las Tinajas, 10 miles above La Jagua, a considerable flat gave 10 colors to a pan.

"At Sara, 17 miles, I obtained fair results, but river was too deep. At 20 miles are rich bars and banks, particularly at Cacao Colorado. I consider it an extensive and deep placer.

"Pozo de Funes bar, 22 miles, gave me an average of 30 colors to a pan. At 24 miles, a considerable bar and small island, prospects 50 colors to a pan. The banks from here up are literally full of fine gold. The natives get coarse gold by diving under water. El Mejicano Ford, at about 37 miles, gave me an average of 10 to 20 moderate-sized colors to a pan. At the end of Cajon de Oro Menudo, 29 miles, a small bar on southeast side of river gave me 100 to 300 colors to a pan on the surface.

"The river has a much greater fall than the Guayape River."—Edward P. Mayes, C. E.

There are large deposits of auriferous gravel on the Guayape River among which are the Murcielago bank, the Espanita gold placer about the falls of Espunesa and many other rich bank and bar deposits.

GOLD VEINS.

There are abundant quartz outcrops in the adjacent mountains of 4,000 to 5,000 feet elevation. Prospects assay \$30, \$40 and \$70 per ton. Ledges have been discovered near the Redondo on Rio Salto, and assays of outcrops prove a mineral region to exist on the south slopes of the mountains facing Jalan River. At Monte Rosa, 3 leagues east of Juticalpa, there are 2 gold veins, strike N. W. and S. E. Dip 40° South, parallel and with a width of 12 by 20 feet respectively, and 400 feet apart. They are true fissure veins. Can be worked as open cuts by a series of benches. Walls slate, veins white sugar quartz and gold free milling. Gold is also found in the veins with black and red oxide of iron and grey sulphurets of iron and occasional galena. Many thousands of tons of ore in sight. A 5-stamp mill has been shipped. A creek supplies 200 miners' inches of water in dry season, and it is taken to the mill in a ditch $\frac{1}{2}$ mile long. Head at the mill 80 feet, which runs $4\frac{1}{2}$ feet.

Pelton Wheel.—The present working is 1,000 feet from mill and 400 feet above it.

Native gold in Honduras occurs in seams of conglomerate, which carries auriferous quartz. Where lime is found in the quartz veins they are richest in gold. It is often found alloyed with platinum, silver and a little copper.

PLATEAU PLACERS.

Strange to say there are also gold placers in Honduras on the tops of the highest plateaus which are scarcely overtopped by any mountain chains and these consist of auriferous gravel and sand. Equally strange to say most of the gold gravels are richer on the surface than near bed rock. The gold veins are richer near the surface and free milling. As they grow deeper the proportions of silver, copper and rich lead ore increase and much gold occurs in combination with the sulphurets and oxides of the above metals.

\$200,000 HAS BEEN TAKEN OUT OF EL RUSIO BY HAND WASHING.

About Juticalpa are the gold zones of El Retiro, El Rusio, El Vijao, near the mouth of the river Jalan or Teupacenti. Gold occurs in the villages of Rusio and Lepagaura. Gold and silver in the hamlets of El Cororal, San Francisco and Jano, and in the latter is found also a vein of opals.

The arroyas (small deep cut, but shallow brooks), Almen-

dares and La Pita in the town of Campamento, in your concession, have gold. In the town of Solano, 36 miles west of Juticalpa, the arroyas Panal and El Jute carry gold, as also the Quebrada de Oro in the hamlet of Tolgua.

CONFIDENTIAL.

"I have just returned from a careful examination of the Guayape and vicinity. The Quebrada Grande and the Ramonte (upper Quebrada Grande) in Bell's concession carry gold. Bell has only worked about $\frac{1}{2}$ a mile of the Quebrada Grande in the middle and has taken out over \$200,000 by hand washing and crude appliances. The lower part of the Quebrada Grande and the Guayape are splendidly located and situated for hydraulic washing and suction dredging, as you suggested, and are very rich.

SPEARS' INTEGRITY UNQUESTIONED.

"There are certainly over two million dollars in there that we can take out and we can handle it."—(Extract from report of H. A. Spears, Mining Engineer).

In Manta, 25 miles northeast of Juticalpa, on the road to Truxillo, there is a silver vein and another of copper. In Rosario there are 3 veins of copper and lode gold and in Concordia there are several veins of gold. All the river Guayape (upper Patuca) and the arroyas Orico, Montanuela, Calderon, Jiconte and Vallecito carry gold. At Margulili and Jagua there are gold placers. In fact, there are innumerable veins and placers in all the department.

The hand washings are now so nearly exhausted that the Indian women can only make in a day on the average from \$1.25 to \$2.50, but the deeper parts of the river, and much of the adjoining flats are untouched, although the Indian women now make their best gains by diving in the deep pools and filling a calabash with sand from the bottom. In many places the banks contain rich gold deposits at and below the water level with an overburden of earth from 8 to 15 feet thick, which is too much for profitable hand labor.

SIXTY MILLION CUBIC YARDS.

Major E. A. Burke, who succeeded to the mines of the Olancho Exploration Co. (Ltd.) assured me that placer gravel of the Honduras Gold Placer Company on the Guayape produced under his working 60 to 75c. of gold per cubic yard at a cost of 15c.

He worked it several months until the dam was carried away.

The Torros placer bank is estimated to contain 60,000,000 cubic yards of gravel, carrying 40 cents worth of gold per cubic yard. * * *



GAME KILLED BEFORE BREAKFAST—PATUCA VALLEY.

In 1887, 1888, 1889 and 1890 there were denounced in the Department of Colon 9 gold mines, 2 silver, 2 gold and silver, 1 of lead and zinc, and 1 each of nickel, iron and lead. In Department of Colon, there is a vein of gold and silver on the bank of the Rio Negro, near Truxillo, and also in Las Quebradas and the Rio

Balfate and there are auriferous quebradas (or brooks) east of Balfate. Two miles from Sonaguera, in the Aguan Valley, there is an abandoned gold and silver mine. There is a mine of copper in a place called "Marmel de Santa Fe" and on the same river a vein of stone coal. In 1889 were denounced a gold mine called "Rey de las Payas" and a gold and silver mine called "Providencia." A mine of antimony has also been discovered in Colon.

Coming nearer home, the left hand tributaries of the river Sico or Grande, coming from the Mountain Poyas Peak, called El Oro, Las Bellatas, Alao, Tayaco, Naranjal and La Pita are all notable for their gold-bearing sands.

Not many years ago in a rivulet near the village of El Dorado on the Agalta branch of the Rio Negro a gold washer obtained 13 pounds of gold in six days.

TRANSPORTATION NEEDED.

Mr. Gausines, a mineralogist, who has well examined the mines of Honduras says: "It is easier to find mines than men to work them, and if they would work and improve the ways of communication the mineral productions of the country would in a short time rival those of Mexico and Peru."

In Olancho at Santa Bar, there is white, black and veined marble. At San Felipe, on the river Los Canitos, there is gold, and on the upper Jalan, 5 miles from Danli. And there are gold placers on the Nicaragua boundary on the Wanks River.

Cinnabar has been found on the Aguan River and also petroleum and coal. Excellent deposits of zinc have been found on the islands of Roatan and Bonaca.

PEARLS AND COPPER.

Copper is found in Olancho also, between the rivers Guayape and Jalan, north of Chavela, which has been coined at the Honduras mint. It carries gold.

Valuable pearls are found in many of the fresh water streams of the State, and also in the oysters of the Bay of Fonseca, and the lagoons of the north coast.

NO DUTIES.

All mining plants, machinery, explosives, chemicals, etc., used in mining are admitted free of duties, and all minerals can be exported free.

WOODS AND THE LUMBER BUSINESS.

The following woods occur in Honduras and probably nearly all of them in the limits of your grant:

Frijolio. Grows 2 to 4 feet in diameter and 30 feet to first limbs; color yellow, turns red or reddish brown; heavy, strong and hard. Resembles live oak except in color. Very durable out of the ground and lasts for years. The seasoned wood never shrinks. The heart wood never splits. Much used for spokes and cartwheels.

Jicaro. A fine cabinet wood. Makes good railroad ties, would make excellent ship timber and gun stocks.

Melon (calabash tree), *crescentia*. About 6 inches diameter. Straight trunk and spreading branches; very fine grained. Color yellow. Young wood much lighter. Good for turned work and canes. Closely resembles boxwood and the heart would probably do for wood engravers. Very heavy.

Guachipilin. Will cut logs 2 feet square. Color, young wood, light brown or yellowish. Old, dark, resembles black walnut. Is not a tenacious wood, but makes fine wheels and would make good gunstocks. Lasts almost forever in the ground, and no worms eat it. A heavy and fine cabinet wood. Posts have lasted in the ground 200 years.

Liquidamber, *Styrax Officinalis* (Sweet Gum). Grows 3 feet in diameter and 50 feet long. Color, light reddish gray. A close-grained light wood but soft. Resembles elm, but not so strong. Makes good boards. Very large trees are apt to be hollow. Furnishes benzoin gum and an oil which is a very good balsam for wounds. This is the *sweet gum* of Florida and the Southern United States. It is there used for making small wooden saucers for grocers, for putting up butter and lard, being cut and stumped out when green and flexible.

Pinabete (white pine). Grows 6 feet diameter and 50 feet long. Color, yellowish white, not as white, light or soft as white pine of United States. Has a slight reddish tinge. Somewhat resembles pumpkin pine, but is not so coarse. Very abundant on the mountains.

PINE.

Ocote or *jocote*, *Pinus Palustris*. Long leaved yellow, hard, pitchpine. Appears to be the Cuban variety. Has long leaves but small cones. Will square 26" and 40 feet long. Equally hard as Florida pine. Yields good turpentine. Measured one tree 11 feet, 11 inches in circumference. Trees have more top and will

not cut so long as the Florida pine. Is heavy and strong. Grows on the savannas and rolling pine lands near the coast and on the rivers. Will run 6 to 7 saw log trees to the acre, in some places more scattering, plenty of suitable size for railroad ties.

Captain Henderson, before quoted, speaking of the pine of Honduras, says: "In general it is considered for all classes of objects much superior to that they import from the United States."

Spruce Pine, 18 to 24 inches in diam. I noticed large quantities of this pine similar to that that grows in Florida, United States, in the mountains, on the road between San Pedro Sula and Tegucigalpa. This pine is not counted of much value in Florida, but will make good boards for inside work.

Granadillo. Grows 4 feet in diameter, 2 kinds, the *Granadillo de Montaña*, which grows in the mountains, and the other kind which grows in the lower lands. Both are hard, close-grained, strong, durable and heavy. The former is lighter in color and weight than the latter and lasts well in the ground, but is not so handsome a wood for cabinet purposes. The heart resembles live oak, but with a reddish tinge and with red streaks. The sap wood is white. This wood in Nicaragua has the heart almost black. The low land variety is a much more beautiful cabinet wood, heavier, darker, closer grained and more beautifully striped. It resembles mahogany very much. It is very strong and takes a beautiful polish. It is used for furniture, rulers, carpenters' try-squares, planes, handles, etc., and could be used for any purpose for which mahogany is used. Would make beautiful gun stocks.

CEDAR, SIXTY FEET IN CIRCUMFERENCE.

Cedro (Spanish Cedar); *Cedrela Odorata*, L. There are 3 varieties, *Cedro de Valle* or *Cedro Real* (Royal Cedar), *Cedro de Montaña* or Mountain Cedar and *Cedro de Costa*, or Coast Cedar. Of these the first-named is the best and grows sometimes 20 feet in diameter, and 78 to 80 feet high, as I am creditably informed by Mr. E. P. Mayes, a well-known and highly respected civil engineer of Honduras. The Royal cedar comes next to mahogany in the estimation of many and is a beautiful cabinet wood, easily worked.

It is much more close grained and heavier than any of the other varieties of Spanish cedar, with wavy markings and burls and will take a fair polish.

The *comejens*, or white ants or any other insect will not eat any of the cedars. They are of reddish color (sap wood, white), with an agreeable odor, and make beautiful furniture and insect-proof

chests, especially the Royal cedar. There is always a special demand for Spanish cedar in the markets. Largely used for making cigar boxes and canoes.

A house of four rooms was built by the Honduras Gold Syndicate on the Jalan River from one large cedar tree.

Roble or *Encina* (Oak), *Quercus*. Grows 2 feet in diameter. Several species. That of the vicinity of Tegucigalpa resembles our white oak, and is strong, hard, fine-grained and dense, and the heart lasts well in the cold climates. Is a good cabinet wood. The bark of *E. Curtidor*, *E. de la Montaña* and *E. de Valle* are used for tanning. The live oak grows very large.

Almendro (Almond Tree). Called Ibo and Break Ax in Nicaragua; 4 to 5 feet diameter. Tall and straight. Will cut logs 40 feet long and over. Hard, but not very close-grained; very heavy, a good cabinet wood, reddish, with lighter streaks. Somewhat resembles black walnut. Does not take as good polish as mahogany, but resembles it a little. Makes good beams and posts durable out of the ground. Bears an edible almond.

ROSEWOOD, SQUARE FIVE FEET.

Coyote, Nimbaro, Palo de Rosa (Rosewood). *Amyris Balsamifera*, L. Logs will square 4 to 5 feet. A beautiful cabinet wood, with very fine, close, hard grain and takes a beautiful polish.

Very desirable for tool handles, rules, T-squares, planes, etc. Its uses and value are well known, and it is always in demand in foreign markets and is largely exported. Would make beautiful gun stocks.

Mora, Palo Moral (Mulberry). *Morus Tinctoria*, L. Four or 5 feet in diameter. Very strong. Color, heart bright reddish, sap wood yellow. Young trees are lighter colored, sap wood almost white. The heart is a fine grained, hard, heavy wood, very similar to black walnut, but finer and takes a good polish. A beautiful cabinet wood, nearly as good as mahogany; would make beautiful gun stocks.

The leaves are used to feed silkworms.

The yellow sap wood is a well-known dye-wood and is always in demand. Price to Liverpool July 1, 1899, £3 15s. to £4 5s. per ton. The berries resemble blackberries and are a staple fruit in the markets of Florida, United States, where the tree grows wild in abundance. The wood of the Florida variety is not exported, to my knowledge, but is considered a valuable strong and desirable wood by boat builders. The Honduras variety is said to be very

lasting in the ground. Mr. Mayes, civil engineer, states that piles have been in the salt water at Amapala 26 years and the sea worms do not eat it.

Macueliso. Two feet diameter. Excellent timber. Worms do not eat it much. Very light in weight. Color, light gray, with darker pencilings. When dressed has a satiny lustre, soft; slightly resembles ash. Coarse grained.

Tambor. Grows 2 feet in diameter. A soft, light wood. Color, light. Close grained. Wood somewhat resembles birch. Used for making packing cases.

Laurel. The male tree grows 2 feet in diameter. Female 9". Strong, heavy wood, close grained and hard. Color, light, with slight yellowish tinge, and satiny gloss when dressed. Lasts well in the ground in cold climates. The heart makes good railroad ties and ship timbers and the sea worms will not eat it. (Mayes). A good cabinet wood.

Espina Blanco. (Thorn). *Acacia Arabiga*. Small tree of the Acacia family. No use for lumber. Color light, heart reddish. Medium in weight. Wood resembles ash a little, when full grown. Has medicinal uses. The bark boiled in water makes as-a-foetida. A decoction of the root cures spider bites on mules, which are very troublesome here, there being a spider which bites mules and horses' fetlocks and renders them lame. Tree exudes a *gum arabic*. Ashes makes strong potash. Numerous on Pacific coast.

LIGNUM VITAE.

Guayacan or *Guayaco* (Iron wood). *Lignum Vitae*. Two varieties, black and green. Grows 2 feet in diameter. Dark-brown streaked; extremely hard, extremely heavy, very close-grained and strong. Will polish, resembles ebony, but is not so dark. Used for making sheave blocks, tool handles, etc. Used for ties on Panama railroad; would make a good cabinet wood; cannot drive spike or nail into it when seasoned. E. P. Mayes, C. E., formerly midshipman in Royal Navy, says the wood grows in Egypt. A gum was obtained from it that was used by the ancient Egyptians in preserving mummies. This gum, called in the pharmacopias *guaiacum*, "is largely used as an abortifacient by the negroes of Florida." It is said (B. B. Pears) that the sea worms will not eat this wood. E. P. Mayes, C. E., confirms it. Specimen No. 1 in the collection was cut from a piazza post of the house of Don Constatino Fiallos, civil engineer of Tegucigalpa, which had been placed there 250 years ago.



MONORAIL PORTABLE RAILWAY COMPANY
CHICAGO

SINGLE RAIL BANANA "TRAIN."

Quiebrahacha. (Breakax). *Sydeorylum*. One foot in diameter, strong, durable, very hard, very close-grained and very heavy. Color dark brown, slightly streaked with darker. A fine cabinet wood. Resembles black walnut, but is closer grained and darker. Is very durable, but splits easily in the sun. Mr. Lakie, formerly chief engineer of the Honduras Railroad, informs me that part of the railroad wharf at Puerto Cortez is built on piles of this wood and that the sea worms do not eat them at all. Mr. B. B. Pears, formerly superintendent of the same railroad, confirms this. He says the worms ate up Santa Maria and also the composite piles used there which were made in the following way: A 6" x 6" scantling of the proper length was thoroughly tarred with pitch; to this was nailed 1" boards of same size, thoroughly tarred. To this were nailed other tarred boards, always breaking joints. This arrangement proved utterly worthless.

There are a great many woods in different countries called "breakax" from their hardness, which are of entirely different species.

In Florida, United States, it is the live oak, especially the dead, dry seasoned wood, which is so hard that it will break an axe almost like iron.

In Nicaragua it is the Ibo or Almendro. In Columbia it is the Eboni or Ebony. In Argentina it is the Rey del Palo. All of these differ from each other, and the only way to properly classify these woods is by flower and leaves, the true botanical method.

PLENTIFUL.

Ronron. Named from a boring bee, called the "Carpenter bee." Grows 2 feet in diameter. Color of Jamaica rum, or burnt sienna, clouded and streaked with light and dark shades, black and reddish. A very beautiful cabinet wood excelling mahogany. Makes beautiful veneers. Strong, durable, extremely close-grained and hard, and takes a polish not excelled even by mahogany. Straight and 40 feet to the branches. Makes the handsomest furniture, tool handles, T-squares and native pianos and instruments. Unfortunately a large bumble bee, with white spot on its head, bores holes in it $\frac{3}{4}$ -inch in diameter. Appears to be the same insect that bores the red pencil cedar of Florida. Ronron trees in Nicaragua are not attacked in this way. Has been exported by Messrs. Pears Brothers of San Pedro Sula, Honduras.

Magucy. (Bolsa wood), called *Polok* by the Mosquito Indians. Grows about 18 inches in diameter. An exceedingly light wood, all pith. Light colored. Straight, very soft. Used for rafts

and floats, bouys, etc. Can be put to many uses. Outer skin is thin and hard. Sections of small branches are used as pin cushions and the barbers cut off the outer shell and use the interior for razor straps.

Quassia. (Cruzita). Grows about 1 foot in diameter. Color, light uniform yellow, young trees, older trees brown. Strong, fine-grained, light weight. Resembles elm wood a little or perhaps like beech. The old trees are hard. A medicinal tree. It is customary to turn cups of this wood. These being filled with water and allowed to stand half an hour, the water will be found to be strongly impregnated with the excessively bitter principle of the wood. It is drank as a tonic and cure for fever and is said to be efficacious.

Uzia. A large tree, 30 feet high, $2\frac{1}{2}$ feet in diameter. Color, reddish brown, prettily mottled with darker blotches on a pearly ground. Straight and splits very good. Durability more than 50 years. Strong, very close-grained, hard, dense and heavy. Takes a fair pearly polish. An excellent cabinet wood. Much used for making chairs in Honduras. Resembles no other wood that I have ever seen. Would make handsome gun stocks.

LIKE MAPLE.

Uzia de Montaña. A large tree, 25 feet high and 3 feet in diameter. The wood entirely different in appearance from the preceding. Exactly resembles white maple. Splits easy and checks badly. Color, white. Very desirable like cedar and lasts 50 years. Durable in the ground. Straight, solid, fine-grained, heavy, hard and strong. Used for roofs, beams and furniture in Honduras.

LIKE HICKORY.

Doradillo. (Gilded Wood). Size, $3\frac{1}{2}$ feet in diameter. Length unknown. Very strong, fine-grained, solid, very hard, and will take fair polish. Color, uniform light *café-au-lait*. Splits easy. Durability 25 years. Quite durable in the ground. A good cabinet wood. Straight, used for roof beams and tools. Resembles fine hickory, would make excellent gun stocks. ?

Guacucó. A large tree, 20 to 25 feet high and $2\frac{1}{2}$ to 3 feet in diameter. Color, nearly uniform light gray, heart much darker. Straight, very strong, very close-grained and solid and smooth. Medium weight. Splits well, is extremely hard and takes a good polish with a dark pearly lustre. A fine cabinet wood. Is very durable, lasting 50 to 60 years, and lasts well in

the ground. Is used for furniture and shoe soles. Would make good tools and instruments, rulers, etc. Resembles live oak in texture, but is much finer.

HARD WOODS.

Dienta Bella. (Beautiful tooth). A large tree, 2½ feet in diameter. Color, bright yellow, streaked with brown, strong, straight, splits easy. Is hard, heavy, very close-grained, and takes a very pretty polish. Durability over 30 years. A very pretty cabinet wood. Used for furniture, beams, and for inlaid work. Would make beautiful veneers. Would make good tools and fine instruments. Resembles very closely the Florida mulberry.

Teresica. A large tree, 35 feet high and 2.5 feet in diameter. Color, heart, cherry red, prettily mottled with darker, giving a general light reddish effect, with dark cloudings. Very strong, heavy, very fine-grained and solid, takes a beautiful polish. Sap wood nearly white. Lasts for more than 50 years, like iron in the ground or exposed to weather. Tough, with interlaced fibers, and splits hard. A handsome cabinet wood. Used for construction of houses and furniture. Would make beautiful veneers, gun stocks, tools, instruments, etc. Resembles cherry wood.

Toulón. Size unknown. Color, uniform grey. Strong, fine-grained, hard and takes a fair pretty polish. Medium weight. Appears to split easy. Durability unknown. Used for roof beams. Would make good tools. Resembles white ash, but is harder, I think, and closer grained.

Maiculile. Size unknown. Color, heart, yellow, sap wood dull white. Strong, heavy, fine-grained, hard. Harder than Diente Bello. Takes a good satiny polish. A good cabinet wood. Resembles Diente Bello or Florida Mulberry. Used for making furniture.

Santa Maria. A large, tall, straight and valuable tree, 2 and 3 feet in diameter. Grows in low lands and much resembles mahogany.

"THE MONARCH."

(Mahogany.) Spanish Caoba. *Swcetinia Mahogoni.* Height, 70 to 80 feet, forty to fifty feet to first branches. Diameter up to 15 feet. A well-known wood, the character and uses of which are well known. A magnificent tree, the Monarch tree of Central America.

In August the leaves turn yellow and can be seen at a great distance. In the countries to which it is exported, it is only

thought of as a cabinet wood, but it is in many respects better than oak. It shrinks less, warps and twists less, is more buoyant, weighs less and holds glue better. The average weight of Honduras variety is 35 lbs. per cubic foot, while white oak weighs 48. It is slow to take fire, is free from dry rot and the effects of acids and does not suffer from changes of temperature. Metals do not corrode it, which is a valuable property. It is largely used for house building and all construction purposes and boat and ship building in Central America.

There are two varieties: common or low-land mahogany and the mountain mahogany. The low-land variety is the best, the mountain mahogany being lighter and not so close-grained, shading off into Spanish cedar, which it closely resembles.

Mahogany trees have large triangular buttresses at their bases which render it necessary to cut them 10 or 12 feet from the ground, for which purpose stagings are erected for the axmen. After felling the tree, the trunk is cut off at the first limbs. The immense stump and roots and the top of the tree are the best, as they contain numerous whirls, eyes, veins, burls and cloudings, which are very beautiful, when cut and polished, but up to this time all this most valuable part of the tree is wasted and left to rot in the woods, owing to the difficulty of getting out the stump and cutting it up, and in the case of the short top logs, the vessels will not take them, or rather they charge a prohibitory freight, unless they can have a complete cargo of this small stuff. On the other hand, the choppers never cut trees over 5 or 6 feet in diameter, as they cannot handle them. It is very difficult to cut a tree with an ordinary ax that is more than 6 feet in diameter. When felled, the slabs taken off with an ax to square such large trees are so thick that the work is very slow and laborious and entails great loss of good lumber. Then to haul logs of a size so large, requires larger trucks and more oxen and tackle for loading them, and so they plan their outfit or plant for no trees larger than 6 feet, and here again the finest and best lumber is left in the woods untouched, although in Oregon we find no difficulty in moving and saving much larger trees. These immense trees and stumps should be gotten out whole and taken to a saw-mill near by and there cut up, because the immense slabs, required to be cut from a log 15 feet in diameter, in order to square it, are 2¼ feet thick each, by 10 feet 6 inches wide, and often of the best and most showy lumber, containing knots and burls, and when this is cut off with an ax in the woods, it is all lost, but if cut off with a saw, it can all be recut and saved.

MAHOGANY.

A log 15 feet in diameter will square 10 feet 6 inches, and in order to cut boards of this width the very largest gang saws made are required.

It has been customary to cut some of these trees and split them with wedges and blow them open with gunpowder, but much of the wood is ruined in this way and when the size is reduced to the ordinary size, no better price is obtained than for smaller trees, which are not so troublesome to handle. It is probable that the very largest stumps would have to be cut with hand-swing saws, as they are of an awkward shape to handle. Splitting with wedges should be avoided, wherever possible, as being cross-grained and twisted they split up so crooked as to ruin a large per cent. of the lumber. The very largest stumps are often hollow.

GROWTH OF MAHOGANY.

The popular belief in northern countries is that the mahogany is a very slow growing tree and requires from one to three centuries to arrive at maturity. This statement has been made by early writers and copied into all books treating of forestry of Central America, but it is a great mistake, which arose probably from the fact that in Honduras the mahogany, and in fact most all trees, have three periods of growth in a year, and consequently make 3 rings. Mr. E. P. Mayes, a Government engineer, who came out here from England on the first surveys of the Inter-oceanic railroad and has been here 39 years, assures me that a mahogany tree grows about 1 inch in diameter per year. He says he has seen trees grow large enough to be cut for lumber in 20 years on a "cortes," or "cutting," where they had all been cut off.

Captain Robert Cleaves, Sr., also a Government engineer, who came originally from Saco, Me., and has been in this country and Guatemala over 25 years, says that from his personal observation mahogany trees 6 inches thick, have grown in 20 years to be 15 and 16 inches in diameter, which would give a rate of $\frac{1}{2}$ an inch per year.

This increases the value of all mahogany bearing lands at least four times as much as they would be, if as has been supposed, 100 to 300 years was required for a tree to attain sufficient size to be marketable.

Mahogany *can* be cut at any season of the year, but the regular season commences with August and lasts till April.

because that includes the rainy season and the rivers and creeks are full so the logs can be launched and floated. The loggers say also that if cut at other times it will not split, and they believe that wood will not be durable unless cut on a waning moon.

The remarks in regard to size of logs and special arrangements for cutting them, and, to tops and stumps apply to all the other choice cabinet woods, especially cedar, black-walnut,



YELLOW PINE ON PATUCA RIVER.

Ron-ron, rosewood, etc., the first of which sometimes grows to be 20 feet in diameter.

Mr. Mayes informs me that he was called in consultation as a civil engineer to devise means of cutting and removing two cedar trees on a mountain near Comayagua, that measured 20 feet diameter each, one being a few inches less.

It is well known that black-walnut stumps are extracted in the States and worked up into furniture.

Nogal. (Black Walnut.) Very large and quite numerous. A well known cabinet wood.

Bastard Mahogany. A good large tree that resembles Mahogany a little. Fairly numerous. The Redwood of Florida.

Cortez (Manwood), (Horse flesh) *Lignum vitae*. 30" diam. A very large tree. Varieties: Cortez amarillo and Cortez negro. This wood is yellow and black, in different kinds. The yellow variety sometimes shades into green. I think it is improperly called *Lignum vitae*, which is the Guayacan already described. Cortez is a hard, fine grained heavy and exceedingly strong tough wood, that splits hard and is valuable for ship timber. In the Bahama Islands it is called horse-flesh. There are several sub-varieties. Resembles the live oak.

Jagua. Is a light hardwood.

Kerosene Tree. A tree of large size, containing a great deal of odoriferous balsamic gum, very inflammable. Makes an excellent fire wood for camping parties.

Sapodillo or *Zapotillo.* *Achras Sapota.* A very large, tall, straight, tree, 5 feet in diameter. Color, brownish yellow. A very desirable, hard, heavy, close grained, strong and tough wood, which is extremely durable and is said to be immune from the attacks of the sea worms. It is prized for axhandles, house and shipbuilding, and all kinds of construction. Stephens (Travels in Central America and Yucatan) relates finding a door lintel of this wood in good state of preservation, set in the masonry of a building in the ruined city of Palenque, where it must have been since the time of the Spanish conquest, more than 370 years. This wood is very numerous in the Bay islands and the valley of the upper river. Tree bears an edible fruit, which is exported to the United States. Resembles white oak in character, but is darker in color.

Sauce (Willow). Is small and very numerous on the Patuca and Negro Rivers. Well suited for mattress work. Nearest to Patuca village are $7\frac{1}{4}$ miles.

Maho. A small, soft wood tree, very light and numerous in the river bottoms. Would make good rafts and buoys, but is not nearly as light as the Balsa or Maguey, but has much more consistency, being a tolerably good wood. Wood resembles the cork tree of Florida, United States.

Trumpet Tree (or Tulip tree). Grows about one foot in diameter and 25 or 30 feet high, with a hollow stem. Of no use except for water gutters or pipes. Very numerous in the low river bottoms. Bears a beautiful yellow tulip flower.

Schuche (Mosquito Indian name). A tree about 25 or 30 feet high and 3 feet in diameter. Wood very soft and of little value. Grows in low river bottoms. Might make packing boxes or fruit crates.

Ceiba (or Cotton Wood). *Bombar Ceiba* L. One of the grandest forests trees of rapid growth, 70 feet long and 14 feet in diameter. Wood is soft, light in weight and color, straight, and is used for making good boards, canoes and barrels. Is lighter than pine, but not quite so durable. Can be worked very easily. It flowers 3 times a year and presents a very beautiful appearance. It produces a large pod filled with a downy substance like floss silk, but the shortness of the fiber renders it unavailable for textile purposes, but it is frequently used for stuffing cushions, pillows, etc. Numerous on river banks.

Jocotas, or *Jocote* (Hog plum) or *cirucla silvestre*. Grows 20 to 25 feet high, 1½ feet in diameter. Wood soft and of no value. Fruit a yellow oblong plum, about the size of a small pullet's egg, with large seed, sub-acid, but good, and is sold always in the market of Tegucigalpa. Numerous on banks of Patuca River.

Tamarindo (Wild Tamarind Tree). *Tamarindus Occidentalis*. A very large tree in Nicaragua, in the San Juan valley, but here I did not see any on the Patuca River as far up as I went, more than 9 or 10 inches in diameter. In the other parts of the country it grows as large as I saw it in Nicaragua, 80 or 90 feet high and 2 to 2½ feet in diameter. Color dark. Wood heavy, strong and hard. Is used for making furniture and for posts and beams of houses. May be said to resemble Quiebrahacha or Break-ax. There are two varieties, one of which bears a long pod, which is dried and exported and used as a decoction in water, which makes a delicious cooling drink. The other has a small pod, very sour.

Mangle (Mangrove). *Ryzophora Mangle*. Large spreading trees of three varieties, all about the same size, 40 to 50 feet high and 24 inches diameter. Grows crooked and much branched, and is difficult to obtain long logs. Good for ship knees. Wood three different varieties, red, yellow and white. It is said sea worms will not eat it; very hard, close grained, intertwined fibers; hard to split. Tough. When old and seasoned will turn the edge of an ax. Grows in the salt water, and is numerous on Brewer's Lagoon. Also the *Mangle de Saragoza*.

Sea or Beach Grape (Mangle-grape). *Cocolaba Uvifera*. Small, about 20 feet high, 8 inches diam. Much branched.

Wood hard, handsome and heavy. Bears a very good plum, about size of a grape. Grows on Sea beach. Very common on Florida beaches.

Ficos. (Latin.) *Matopalo* (Wild fig.) A large spreading tree, about 35 or 40 feet high, 3 or 4 feet diameter. Wood soft. Trees numerous on river banks. Bears a fig which is edible and of which deer and hogs are very fond.

Called Matapalo, or tree killer, because when it commences to grow, it attaches itself to some other tree and grows around it and over it, encircling it in its deadly embrace, until at last the tree is choked to death and the matapalo remains feeding on its dead body.

It has a juice, white and sticky, like rubber, which runs out where the trunk is cut.

It resembles the Indian Fig or Rubber tree of South Florida, in everything, except that the fruit of the Florida tree is no larger than cherry and is dark purple or black.

Pocote. (Provision Tree, so called by Mosquito Indians.) 20 feet high, about 1 foot diameter. Wood soft and sappy. Used for fences and hedges. Stakes of this wood driven in the ground take root and grow. Bears a large brown edible fruit larger than a cocoanut. Think it belongs to the Anona family, but the fruit resembles a sapote.

Labena (or Naked Wood). Tall and straight, 50 or 75 feet high, 40 to 50 feet to first limbs. Diameter, 2 feet. Hard and very heavy. Makes good lumber. Resembles the Palo de Plomo or Lead wood, and I think it is the same. Grows along the rivers. Appears as if without bark, at first sight. Grows in Florida.

Buttonwood. Small, 20 feet high, 10 inches diam. Hard and good and much esteemed for fire wood. Grows on shores of Brewer's Lagoon. Also good in Florida, U. S.

Crabo. (Crab Tree.) Low and spreading, small, about 8 inches in diameter. There are two kinds. Makes good firewood and good small boat timbers. Resembles the black oak. Grows in Florida.

Coco Plum. Bush about 15 feet high. Bears a very good sweet white and purple plum in great abundance, about size of a small peach. Grows on the sea beaches, from Florida to Nicaragua. Called by Columbus "Coxinas."

Pigeon Plum. Small and spreading 20 feet high and 4 or 5 inches diameter. Wood hard, like cherry, and an excellent firewood. Bears a small but good plum in abundance. Grows profusely in vicinity of Patuca.

Yemari. A large, tall and straight tree, 4 feet diameter. Wood

light colored, soft and coarse grained and resembles white pine, but is coarser. Used for making dug-out canoes. Can be used for nearly anything white pine is used for.

Tuberosc. Tall and straight tree 30 feet long to branches and 9 feet diameter. Wood hard, grain coarse, fibers twisted like corase black oak, with interspaces of softer wood. Hard to split. Used for making dug-out canoes. Grows in middle section of Patuca river.

Flores de azul. (Blue Flower.) Large tree of excellent wood, soft to work and strong. Much liked by mechanics.

Guanacaste. *Ramnus Sarcomphalus*, L. A noble tree of immense size and with an enormous spread of branches, 60 to 75 feet high, and has been known to attain a diameter of 15 feet. Fine durable lumber. Produces large quantities of gum which might be made available as an article of commerce.

Jenifero. (Acacia Family.) A great tree. Excellent wood unknown to commerce as yet, between Mahogany and Cedar.

Siljulea. 18 inches diameter, 75 feet high, straight; bark pitted like a pineapple, but not so close together. Wood very hard and fine grained, banded and mottled chocolate and yellow. Makes fine pipes and cabinet work.

Madraño. A very fine grained wood, suitable for turning. Would also be suitable for wood engraving in place of box-wood.

Nispero. Very large tree, tall and straight, 75 or 80 feet high, 7 or 8 feet diameter. Color of wood redish, hard, heavy and under water becomes as hard as iron, and lasts almost forever. A very strong valuable wood for all kinds of construction and a handsome cabinet wood that rivals mahogany in beauty. Bears one of the best of the tropical fruits, like a sapote.

VERY VALUABLE.

Madera negra. *Madre de cacao.* (Black wood, mother of cacao.) Tall and small trunk, about 40 feet high and 8 or 9 inches in diameter. Is very hard, heavy, black color, strong, not very straight, but lasts almost forever in the ground, hence is much used for posts, ground sills, and for ties on the Nicaragua Railroad. Resembles ebony. Is planted by the natives to shade the young cacao (chocolate) and coffee trees. A stick stuck in the ground will take root and grow.

Guapinol. A large tree, 3 to 4 feet diameter. Wood very beautiful and is useful for construction or cabinet purposes. Is

said to resemble Guachipilin. Produces a fruit from which an edible substance is made and a gum equal in every respect to copal. Also the *Guapinolillo*.

Guiliguiste, *Palo de Carbon* (or Coal tree), *Chiquirin*. All these produce woods excellent for underground use and especially valuable for R. R. ties.

Bambu. (Bamboo). This gigantic member of the family of the grasses grows in tropical profusion all along the river banks of the North Coast, attaining a height of 60 to 70 feet and diameter of 8 inches. A most graceful and beautiful plant. Bamboo thickets are almost impenetrable as the lower branches are thorny, while the upper are not.

The trunks are used for building houses, rafters, rafts (owing to their buoyancy) and for fence pickets, being split for that purpose. The joints are about 16 to 18 inches apart and the trunk perfectly hollow between joints. The Indians cut off a joint, leaving a piece projecting on one side for a handle. A hole is then bored in the top and a perfect water tight-keg results, holding about $1\frac{1}{2}$ to 2 gallons. Smaller ones are made for bottles and vials and used for a variety of purposes. They are remarkably light, when dry and seasoned. The top joint being cut out makes a perfect pail or bucket, that needs no hoops and cannot fall apart when dry. I believe a paying industry could be established in the manufacture of these articles for sale in the States, as the cost of manufacture would be next to nothing and the articles very unique and useful and could be made more ornamental by turning in a lathe and painting. It is proposed to use these bamboo in the harbor work, as already explained.

Eucalyptus. (Blue Gum.) Grows 40 feet high and $1\frac{1}{2}$ feet diameter; supposed in Florida, where it grows in plenty, to render the air free from Malaria in its vicinity. It is used in Honduras and Salvador to render impure water healthy. For this purpose the leaves are boiled in water and a little of this decoction, which is bitter, is added to the drinking water.

DYEWOODS.

Brazil Wood called *Palo Lima* in the trade, *Caesalpinia Echinata-L.* Large tree, 2 to $2\frac{1}{2}$ feet diam. Heart wood red, sap-wood yellow. Prices in Liverpool July 1, 1899, £5 15s. to £0 5s. per ton. Largely exported from Amapala and Belize.

Palo de Campeche. (Logwood.) A variety of Brazil wood.

Grows on both coasts. Trees crooked, about 1 foot diameter. Color, of heart wood, almost black. Sap-wood yellowish white. A well-known dye-wood.

Fustic, or *Palo Amarillo*. *Morus Tinctoria*, L. Called in the trade Palo morol. Price July 1st, '69, in Liverpool, £3 15s. to £4 5s. per ton.

Mora or *Moran*. A very large tree 4 to 5 feet in diameter. Largely exported from the Pacific coast to Havre, France. Color, a light mahogany shade.

Sandalo amarillo. (Yellow sandal wood). *Santalum*.

Sangre de dragon. (Dragon's Blood). *Pterocarpus Draco* L.

Nance. Large tree, wood used for tanning hides, bears a small edible cherry. Wood soft and of no use for construction.

Elequene. Also used for tanning.

Achiote, *Tile*. (Annatto.) *Bixa Orellana*. A large spreading tree 2 feet diameter. Bears a pod resembling a chestnut, which is used for coloring butter and largely exported.

OTHER WOODS.

Zumaque. (Sumach tree). *Rhus Coriaria*, L. Is well known as a tree used for tanning.

Algarroba. (Carob tree, or St. John's bread). *Hymenaea Courbaril*, or *Ceratonia Siliqua*, L.

Arroyan. (Myrtle.) *Myrtus Boeteca*, L.

Mano de Leon. (Lion's Paw).

Oja Pendula. (Hanging leaves).

Nacascotte.

Palo jiote.

Cong. A very durable wood.

Pride of India. Grows 50 feet high and 2 feet diameter, with a spread of branches over 100 feet, furnishing a mass of foliage perfectly impervious to sun or rain.

MEDICINAL TREES, GUMS AND PLANTS.

Goma Arabica and Liquid amber have been already mentioned.

Copaiba. *Copaifera Officinalis*, L. Furnishes a valuable balsam, used in venereal diseases.

Turpentine.

Copal. *Hedwigia balsaminifera*. Furnishes the well known copal varnish.

Copal de Ceylon. *Hymenaea Vermicosa*.

Copalillo. *Hymenaea Courbaril*.

Palma Christi. *Ricinus Communis*. A soft tree-like plant that produces a nut from which castor oil is made.

Guapinol. Also the *Guapinolillo*.

Guaicum, ———.

Hule, or *caoutchouc*. (India rubber). "*Castilloa elastica*." Grows 40 feet high and 2 feet diameter. Very large leaves. Trunk straight and smooth. Wood soft and of no value. A new process has been discovered of making rubber from the leaves, which will yield 5 or 6 crops per year.

RUBBER.

Grows wild all through the Patuca valley and north coast. A large tree will produce 20 gallons of sap and will run dry in a single day. The sap is strained through sieves, 1 gallon of sap will produce 2 lbs. of gum. In Brazil the sap is boiled, but in Central America the sap of a vine called Achuna is mixed with the rubber sap and coagulates it. It is then washed and is ready for market. Trees are set out about 15 feet apart in the woods, only a few bushes being chopped down around them and left to grow in the shade. In 10 years they will be ready to tap and each tree will yield from \$3.00 to \$6.00 per year.

Honduras rubber now sells at 65c. per pound in Honduras ports, and would bring twice as much if properly prepared, but as the Indians bring it in, it is very dirty, and full of sand, sticks, leaves and water.

The Government pays a bonus of 10 cents for each rubber tree, provided not less than 2,000 are planted. Act of October 6, 1893.

Guta Perca (Tuno, Gutta Percha), a tree about 30 feet high and 1½ to 2 feet diameter. Large leaves, straight trunk, and resembles the rubber tree. The Poya Indians make a kind of cloth from the bark, stripping it off in large sheets as possible, macerating it in water and pounding for a long time on a block of wood. They use it principally for bedding. Grows in the Patuca valley abundantly. Gum is exported, but does not command as high a price as rubber. Juice very caustic. Burns the flesh and dangerous to the eyes when cutting. Indians cover the face with India rubber gum when cutting.

There are also the following: *El Balsamo* or Balsam de Peru, which is abundant in the mountains of Siguatepeque. Albert Augspurg, formerly German consul in San Salvador, had four-fifths of the whole output in Salvador, and made \$100,000 per year in silver. The principal market is Hamburg. Nine

to 10 lbs. in a gallon cost \$1.00 silver per gallon, crude, and refined, sells for \$2.00 per lb. *El Jiñicuite*, the Copal of Ceylon, *Hymenaea Vernicosa*; *Copalillo*, *Hymenaea Courbaril*; *Guapinolillo*, *Zarzaparrilla* or

Sarsaparilla, *Similas Medicinal*, the best quality produced in the world, and in great abundance on the whole of the north coast.

Cinchona or *Quinine tree* (or Peruvian Bark). Grows in Nicaragua, and would here if planted in the low lands. It is said to be very profitable. Quinine of commerce is made from the bark.

Quassia.

Vanilla. *Epidendrum Vanilla*. A vine bearing the celebrated fragrant bean which is here notable for the large size of the pods, which sell for \$8.00 to \$9.00 to \$15.00 per pound in the States, and can be bought from the native collectors for 50c.

MEDICINAL PLANTS.

Also *Ipecacuanha*, *Jalap*, *Croton*, *Hellebore*, *Aconite*, *Condurango*, *Belladonna*, *Ginger*, *Aloes*, *Rhubarb*, *Licorice*, *tonka beans*, *kola-nut*, *Camphor of Formosa*, *Coco*, *quisquis* or *quiscamo*, or *tania*, and *podophyllum*, from the root of the *Granadillo* vine, or *May Apple*, and others in countless variety, the virtues of which are well known to the Natives. But only a few can be found in the pharmacopœia of the U. S., such as the *Caroa*, a large tree 30 or more feet in height and 1 to 1½ feet in diameter, with pink flowers, an infusion of which in boiling water is a specific for cough. Bears a bean 30 inches long, good for herpes and skin diseases in general, and is a regulator of female periods. The leaves are good for summer complaint, and also for skin diseases.

Huaco or *Guaco Serpentina*.—A parasitical vine; is an efficacious remedy for snake bites.

Espino blanco (*Acacia Arabica*). The root is used, macerated in hot water and taken internally, and also applied to the bite. The *Cedron*, a soft nut that cuts like soft pine, is said to be equally efficacious.

Also the seeds of the *snake akro*, which is a vegetable, made into a paste and applied as a poultice and taken internally. Also the plant known as the *Eryngo*, is known to be efficacious. However, snakes are not at all numerous.

The *Chilpate*, a vine, which is pounded to a pulp and a decoction made in water. This is then thrown into the water, where there is fish. It intoxicates them so that they can be caught with the hands. Is possibly the *Sapindus Sapanaria*.

VEGETABLE OILS

are produced by the following: Corozo Palm, Cohune Palm, Coyol Palm, the Jolis, Marango, Cacaquate, Castor oil plant and Cocoanut.

FRUIT TREES.

Nispero or *Sapote*. *Sapote Maurosa*. Five and 6 inches diameter, brown and sweet. Wild and abundant.

Sapotillo (Little Sapote), *Achras Sapota*. Size of an apple, brown and sweet; similar to the Sapote. Wild.

Naranja. (Orange.) *Citrus*.—Large and very sweet. Equal to the best Florida. Two crops are raised in a year. Wood of all the *Citrus* family is hard, fine grained and esteemed for cabinet work.

Limoncillo (Lime). *Citrus*.—Abundant.

Limon (Lemon). *Citrus*.—Large, thin skinned and juicy, equal to best Sicily.

Lima (Sweet Lemon), ("Forbidden Fruit.")—Plentiful.

Cidra. (Tree Citron.) *Citrus Tuberosa*.

Taronja. (Grape Fruit or Shaddock.) *Citrus Decumanum*. A fruit 5-6 inches in diam., resembling the orange. Brings \$5 to \$6 per box in New York City.

Cacao (Chocolate). Cultivated. The Government pays a bonus of 10 cents for each cacao tree planted, provided not less than 2,000 are planted.

Cacao Mico, or *Cacao Silvestre*, wild Chocolate. Grows in great abundance on North Coast. Smaller than the cultivated. Much esteemed for its good flavor.

Sea Grape, or *Mangle Grape*, *Cocolaba Uvifera*.

Almendo. Wild Almond.

Anonas of various classes, such as Sugar Apple; the Chirimoya, *Anona Reticulata*; the wild, *Anona Squasumosa*, and the Guanavana, *Anona Muricata*. In the opinion of Humboldt and many others, the Chirimoya is the most delicious fruit of America. Called in Jamaica sweet sop and sour sop.

Aquacate (*Avocado Pear*, Alligator Pear), *Persea Gratissima*. About the size of a large Bartlet Pear, up to twice as large. Has

a large, round seed. Is called vegetable butter, and is a natural salad, very highly esteemed. Green and brown, smooth skin.

Tamarindo.

Guayava (Guava), *Psidium Guajavas*. Varieties: *Guayava Savana*, *P. Pomiferum*, *Guayava China*, *P. Simense*. All these fruits differ but slightly. They are round, about the size of a peach, smooth skin, yellow and some white. Inside, some red, some white and some yellow. Sub acid. Full of seeds. Make the well-known guava jelly and sauce. Wood hard and good. Tree about 6 inches in diameter and 20 feet high.



YOUNG BANANA PLANTS GROWING IN FELLED JUNGLE.

Piñus (Pineapples), *Bromelia Anona*. Several varieties. Grow luxuriantly.

Mango (*Mangofera Domestica*). Two varieties: common Mango and Mango chato. First is best. Grows wild. Delicious fruit, with a large seed. Skin smooth. More nearly resembles

a clingstone peach, but is larger and kidney shaped. Color reddish yellow and green, with blotches. Large tree 40 feet high, 2 to 2½ feet diameter. Spreading. Wood soft and not used.

PAWPAW-MEAT.

Papaya (Pawpaw), *Carica Papaya*. Two varieties, the Wild, which is small and only used in conserves, and the cultivated, which is 12 to 16 inches long, resembling a musk melon in appearance and taste. Very nice. Tree 25 to 30 feet high and 1 to 1¼ feet diameter. Wood so soft it cannot properly be called wood. This fruit is considered a strong abortifacient by the Natives of Nicaragua. This tree has the peculiar property of rendering meat soft and tender which is hung in its branches or wrapped up in its leaves or cooked with it. This fruit and tree is entirely distinct from the pawpaw of the Western U. S.

Granado (Pomegranate), *Punica Granatum*. Size of large apple. Skin smooth red. Inside full of seeds. Pulp red and very cooling and sweet.

Granadillo. A delicious fruit about the size of a turkey's egg, resembling the May apple, but having a delicious flavor. Outside smooth and greenish in color. Grows on a vine. The root furnishes the active principle of podophyllum, a well-known medicine.

Mamey, *Lucuma Bomplandi*. Green or yellow fruit, about 6 inches long and half as thick; rough skin, pulp white, soft, sweet—sub acid, cooling, can be eaten with a spoon and tastes like ice cream. A truly delicious fruit.

Nance.

Jocote.

Manzana Rosa (Rose apple). *Eugenia Jambos*. A small apple, red and white, with the odor of a rose.

Manzanilla. (Little Indian Apple.) Color green. About the size of a small peach. This and the preceding grow on the high lands.

Negrito. (Black Cherry.) Sweet and about the size of ordinary cherry.

Durazno. (Peach.) *Amygdalus Persico*, L. Grows of the largest size on the high lands, and very fine.

Membrillo. (Quince.) *Pyrus Cydonia*, L. Grows of the ordinary size, same as in New England. Found in the Highlands.

Membrillo Silvestre. (Wild Quince.)

Marañon or *Lebibo*. *Semecarpus Anacardium*. Fruit about

the size of a crab apple, smooth skin, yellow and red. Stone on the outside, in place of the stem, gives it a singular appearance. Sweet and a little sour. Very healthy.

Marañon de Hueso. Cassinium Pommifera. Similar to above, but more oval shaped and sweeter.

Caimito. No information.

Sonsapote. Manguiifera domestica. Ditto.

Melon (Musk-Melon). Same as in the States and same size.

Sandia (Water Melon). Grows only one-quarter the size of those in the States.

Zuncuya. Described as very similar to a water melon; sweet, and eaten raw.

Melocoton. A kind of Melon, 12 to 16 inches long, and shaped something like a Papaya. Sweet and good.

Coco Plum.

Pigeon Plum.

COCOANUTS.

Cocoanut. Cocos Nucifera, L. Grows all over the country, but particularly on the north coast, where there are wild groves many miles in extent.

Cocoanuts begin to bear 5 years from planting, and continue for 100 years. One tree bears \$2.00 to \$3.00 per year of nuts, without counting value of husks and by-products. Sixty trees are planted to an acre, and it is only necessary to bury the nut in the earth and clear away a little space around it.

The cost of setting out a grove and getting it in bearing, that is, watching it and cutting the too rank growth for 5 years, including first costs of nuts, is only \$40.00 per acre, and can be done for half that in some localities.

Supa. Fruit of the Supa Palm.

Mora. Mulberry.

Apricots. Reported, but did not see any. High lands.

Tomatoes. Large and small.

Akee fruit. Long and red; about the size of a medium sized Pear.

Star Apple. (Not informed.)

BANANAS.

Guinco (Banana). *Musa Paradisiaca, L.* Several varieties. Long yellow Apple banana, Ladies' fingers; short yellow, etc. Grow all over the country. Wild on Patuca river. A conservative estimate of the profits of banana raising is \$50 to \$60 per

acre; \$50 for the first year and \$60 for the next 10 years. Some say with care \$75. A plantation will continue to produce 15 to 30 years. They ripen every day of the year, but principally from February to July. Plants mature enough to pick in 10 months from setting out of shoot. A bunch weighs on an average 60 lbs., and runs up to 100 lbs. Dwarf Bananas are 3 inches long, called Ladies' Fingers, bear 200 to a bunch, and they grow from the seashore up to an elevation of 5,000 feet.

Sixty feet square of land will produce 4,000 pounds of ordinary sized bananas, which will support 50 persons 2 weeks. Excellent flour is made from the dried bananas and plantains which is used for making bread, cake, etc., and much liked.

There is a manufactory in San Pedro Sula, and they sell their flour for 4¼ cents (U. S.) per pound. This flour is now made so that it keeps equally well with cornmeal or wheat flour, and the process is not expensive. The green bananas and plantains are used. By establishing a factory of this kind we could use up all the small and unmarketable fruit. The banana steamships will not take bunches with less than 8 hands, and these are consequently allowed to go to waste or fed to hogs and mules and cattle.

Platano. (Plantain.) (Adam's Fig.) *Musa Paradisiaca*, L. Largely grown on North Coast. Wild on Patuca River. Exported.

PLANTAINS AS FOOD.

According to Humboldt "a bunch will have 160 to 180 plantains, and will weigh 60 to 80 pounds, and 100 yards square of land, with the plants 3 yards apart, will contain 1,089 plants, and if each plant has one bunch of 60 pounds in weight, we will have the amount of 65,340 pounds of food, and supposing that a man can eat 6 pounds, there will be sufficient to feed 10,890 persons." On the North Coast of Honduras a single plantain weighs 16-17 to 18 ounces, which are more than twice the size of those Humboldt estimated on, and one root plant will have from 3 to 5 plants in a bunch, each with a bunch of fruit. Taking the smallest number, 3, we will have as the product of 100 yards square of land, 196,020 pounds, which will feed 32,670 individuals.

Valle, writing of the plantain, says "that in all the elements that go to form a vegetable, the plantain is distinguished, the glory of America, the riches of her sons, the greatest beauty of the earth."

ONE ACRE OF PLANTAIN EQUALS 133 ACRES OF WHEAT, 44 ACRES OF POTATOES.

Humboldt has been much criticised for his statement that "1 acre of plantains produces a quantity of food equal to 133 acres of wheat and 44 of potatoes," but in view of the flour that can be made from the green plantains and the use of the ripe and green ones for food, taken in connection with the above computations, it does not seem exaggerated. The inner bud of the plant also makes good boiled greens, and the juice or sap is an indelible ink, good for marking linen.

COFFEE.

Cafe. (Coffee.) Coffea-L. There are three varieties. The ordinary coffee of Central America, which is classed by the trade as "Maracaibo," and which grows best on the high lands, but will grow on the low lands also, if not too wet, as I have seen it growing at Truxillo, not over 150 feet above sea level. 2. The second variety is the "Liberia" Coffee, which grows luxuriantly close to the sea. This gives a larger berry of a fine flavor, but the objection to it is that it grows to be a large tree, 40 feet high, and so it is difficult to pick the fruit. It might perhaps be cut back and dwarfed. 3. The third variety, "Caracol" (Caracola), is a round little berry and considered as the best one, like the coffee of the Island of Ceylon, similar to Mulberry coffee in the trade. The Government pays a bonus of 5 cents on each coffee tree planted, provided not less than 5,000 are planted.

GRAPES.

Uva. (Grape.) Vitis vinifera, L. They grow well all over the country. In the times of the Spanish dominion there were large vineyards planted on the mountain slopes of Truxillo, and they flourished so well and gave promise of producing so much wine as to ruin the export of wine from the old country to America; thereupon the king of Spain ordered them all destroyed, which was done, and the raising of grapes was thenceforth forbidden by royal edict, and has never been revived. Ogilvy, the English Geographer, writing in 1661, says, "the country roundabout (Truxillo) abounds chiefly in grapes."

Palo del Pan. (Bread Fruit.) This is a fruit, green in color, round, and about 4 inches in diameter. Is an excellent substitute

for bread, boiled or baked. Grows in great numbers, on a large, spreading, large-leaved tree, about 40 feet high and 2 to 2¼ feet diameter. Wood soft and is put to no use. Thrives in low lands along the coast.

Matasano. A greenish colored fruit, about the size and shape of the very largest pumpkin apple. Taste something like an over-ripe apple and a peach. Has two large stones. A very nice fruit.

Granadillo. A delicious fruit about the size of a turkey's egg and same shape, with hard outer shell, the interior a sweet, semi-liquid, pulp with seeds, very cooling and delicate. Can be drank or eaten with a spoon.

Olives, Dates and Figs grow luxuriantly. *Sago* could be raised.

SPICES.

Pimienta. (Black Pepper.) *Myrtus Pimenta*. Same as the Jamaica Pepper. Grows wild. Berries are larger, but not so strong.

Pimientillo. Small pepper.

Cinnamon. A variety grows wild.

Chile. (*Red Pepper*, Cayenne or Indian Pepper.) *Capsicum Baccatum*-L. or *Annuum* L. Grows luxuriantly. Is dried and ground up for table use. A good business could be done by making Tobasco sauce from these peppers.

Allspice, Cloves, Nuez, Mascada Nutmegs (*Myristica Aromatica* L.).

TEXTILE PLANTS.

COTTON.

Algodon. (Cotton.) Is indigenous, and of the finest quality. Columbus found the natives here dressed in cotton clothes. The descendants of these same Indians now raise, and make the same kind of cotton cloth on the Patuca river.

Instead of being an annual plant it is here perennial, and is a tree growing 12 to 15 feet high and 6 inches in diameter, and yields double the quantity it does in the U. S.

Pita. (In Mexico, *Irtle*.) *Bromelia Pita*. A species of Agave. Fibre 5 to 9 feet long. When bleached and prepared,

cannot be distinguished from silk, except with microscope. Chevrement, a Belgian engineer, says: "Pita ropes are 4 times stronger than hemp."

Yuca. Three varieties with leaves from 18 to 36 inches in length, which produce valuable fibres.



ONE OF OUR NATIVE HOUSES.

SISAL HEMP.

Agave sisalana. *Henequen*; sisal hemp of Commerce grows wild and luxuriantly. Price in Liverpool July 1st, 1899, £33.00 per ton. \$6,000,000 capital is invested in its production in Yucatan.

Ramie and *Jute* could also be raised to perfection. In 1891 there were imported into the U. S. from the East Indies 733,296 bales of jute and an immense quantity of other fibers.

PALMS.

Coca (Cocoanut). *Cocos Nucifera* L. Grows 75 to 80 feet high and 10 inches diameter. (All palms grow smaller in diameter as they grow older.) Well known edible nut. Drinking cups, shells, cordage, mats, brushes and so forth are made from the husks. Oil is made from the nut. Leaves used for thatching houses. Trunks used for piles, houses and Fine Furniture. The fermented milk makes an intoxicating drink. In fact, the many uses to which this tree is put would fill several pages. See my article on Nicaragua woods in "Engineering News." Unfortunately, sea-worms eat cocoanut wood.

Cohune. A low, trunkless palm, much prized by the Indians for the fruit or berries, from which they extract a fragrant oil which they use on their hair.

Warri Cohune (miscalled Acacia). A taller tree. Moderately numerous.

Coyal, or *Corozo* (or Wine Palm). *Elais Guineenses* L. Grows 40 feet high and 14 inches in diameter. Has hard outer shell, interior soft and pithy. Produces an oil (from the fruit) which is perfectly clear and limpid. Is excellent to keep fine instruments from rusting, and would undoubtedly make a desirable watch makers' oil. It brings a high price. Numerous.

Silico cru (or Black Palm). Grows 20 to 25 feet high and 14 to 16 inches diameter.

Supa. Thirty feet high, 10 inches in diameter. Thorny trunk. Appears to be the Maquenji or Pijibiu of Nicaragua. Highly prized by the Indians for the fruit, which is about the size of a peach, some being yellow and some red. They boil the fruit and eat it. Tastes something like boiled chestnuts, and is very nutritious. Is much planted by the Indians.

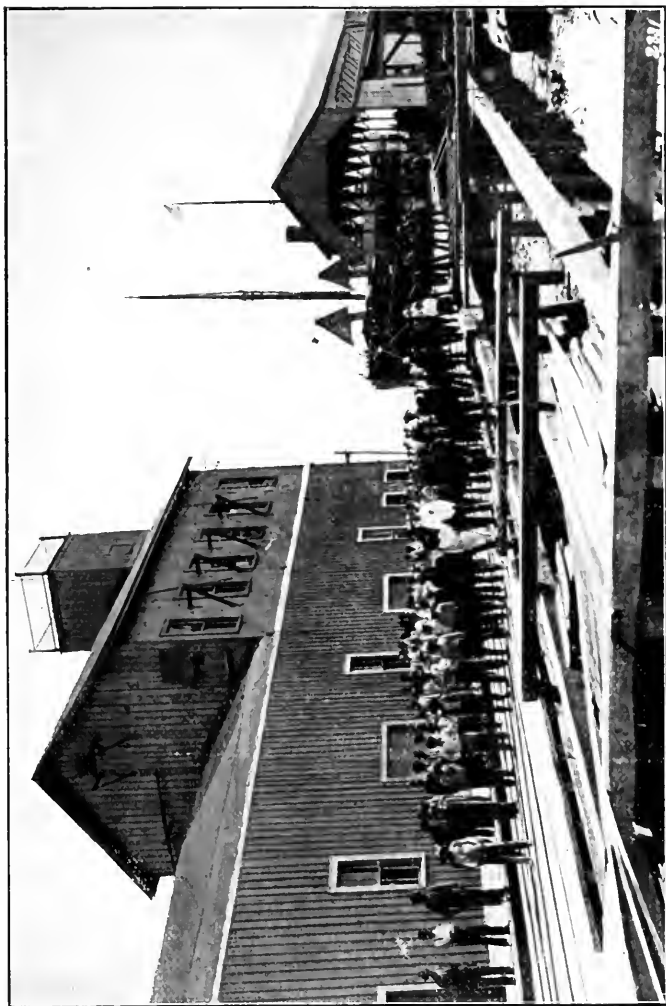
Pijibiu Palm. Resembles the Supa, and is the same size, with thorny trunk. Outer shell extremely hard and takes a good polish for canes and furniture. Inside of trunk pithy. Is used for water gutters and pipes. Numerous in Nicaragua.

Papta Palm. Grows 15 or 20 feet high and about 3 inches in diameter. Rough, scaly trunk. Fibrous. Leaf stalks serrated or with toothed saw-like edges.

Very numerous at Patuca village and on the savannas. Can be used with advantage in Mattress work. Sea worms do not eat it to any extent. Resembles the Saw Palmetto of Florida, but grows erect.

Palmetto. Resembles the last, but has smooth leaves, stalks and trunk, and grows the same size and height. Differs from

the Florida Palmetto in not being serrated and in its erect growth. It is numerous in restricted localities. Grows in the vicinity of Moca Bila.



PUERTO CORTES. PIER AND STATION.

Palma Real (*Royal Palm*, or *Cabbage Palm*). A handsome tree 80 to 90 feet high and only 8 or 9 inches in diameter. Shell very hard, interior soft and pithy. Entirely different from

the cabbage palm of Florida. Grows all along the Patuca river; makes beautiful canes and furniture. Takes a fine polish. The large bud, some 2½ feet long, on top of the trunk is an excellent edible cabbage, as I can testify from personal use.

Palma Blanca (Cabbage Palmetto or Palm). Sabal Palmetto. Grows about 20 feet high in the interior and South Coast. Possibly on the North Coast. Identical with the Florida and South Carolina Palmetto. Bears a small, black and sweet berry, about as large as a currant, with seed about as big as a pea. This seed is roasted and used for coffee in Florida, and in Honduras is considered efficacious for liver troubles. Like the Royal Palm, the bud is an excellent cabbage, and forms a staple article of food for camping parties in Florida. Trunks much used for piling in Florida, as Sea Worms do not eat it as much as some other woods.

Suiti. (Fish Tail, or Monkey Tail Palm.) *Scectinia.* A small low palm about breast high that grows over large areas of level land bordering on the rivers, and is considered a sign of good lands. Might be used for mattress filling on the harbor work.

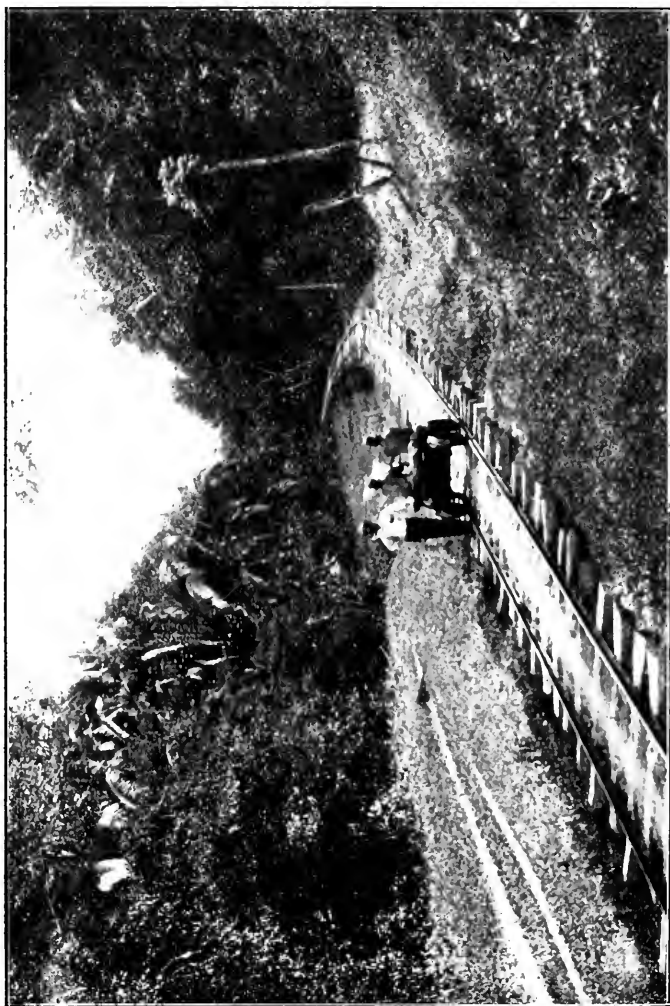
OFFICIAL SPECIMENS.

In preparing this article on the Woods of Honduras, I have been greatly assisted by the late Señor Don Samuel Valladeres, the Director of the Government School of Arts, who kindly caused a large collection of the principal varieties of lumber and cabinet woods to be made and planed or polished and named for me, so I have been able to write my descriptions in most cases from the official specimens.

AGRICULTURAL PRODUCTS.

Mais (Corn). Is one of the principal home staples, and when no drouth occurs, 3 crops can be produced in a year on the same land. It grows all over the Republic, and no fertilizer is used. Strange to say, there are no grist mills in the State, and corn meal or hominy (grits) are never seen. It is always prepared by soaking in lime water, or water and wood ashes. It is then rubbed with the hands until the outer skin is rubbed off. It is then ground on a metate molinera, which consists of a large stone cut out somewhat concave on top and with 3 or 4 short stone legs. A stone roller, about the size of a bread roller, is used to grind it. When thoroughly ground it is baked in thin

cakes like flap-jacks. Corn resembles that of New England, rather than the Southern or Western variety. Forty bushels of corn produce 1,200 lbs. of starch.



TROPICAL FOLIAGE ALONG HOSENER'S RAILROAD.

Trigo (*Wheat*). Is grown on the mountain slopes and down to the level of Juticalpa, which is 800 feet above the sea. There are three or four small wind-mills in different parts of the State that make a good but dark flour.

Centeno (Rye). Is also raised and made into flour.

Cebada (Barley). Ditto.

Arroz (Rice). Grows and heads beautifully. Is much cultivated by the Indians in the Patuca valley.

Patatas, Papas (Potatoes). White or Irish are raised in the high lands, and *Camote (Sweet Potatoes)* all over the State.

Yame, Yuca, Casava, Manioco (Yam). Ditto. They often grow to a weight of 50 or 60 lbs. Those growing on the north coast are notable for their good quality and large size. Valuable for starch making. Six tons of Casava produces 2,400 lbs. of starch.

Coco, quisquis, quiscamo (tania). A large-leaved lily, with roots tasting much like an Irish potato. Very strongly "tonguetied." Astringent when raw.

Frijoles (Beans). Are of universal use, and as cooked by the natives they are very nice. There are several kinds, the red predominating. A kind of white field pea, the garbansas, is large and excellent. Superior to those of the Southern States.

Tobacco. The soil and climate of Honduras have been proven to be well adapted for tobacco. In 1884 leaf tobacco and cigars raised and made in Copan, Honduras, received the first prize at the New Orleans exposition, and this in competition with Cuba and Mexico. There is no tobacco manufactured in Honduras except in the shape of cigars and cigarettes. The Indians on the Patuca river raise all their own tobacco.

Sugar Cane. The soil and location of the lower Patuca valley is pre-eminently adapted for not only raising the cane, but for transportation to a mill erected, say at Patuca, as described more fully in my preliminary report. It grows almost wild for 15 years after being planted, requiring no cultivation of the soil and only a periodical cutting down of the bushes, because the lower river, annually overflowing its banks like the Nile, deposits a rich top dressing of fertilizing sediment around the stalks.

The Indians raise quite a large amount of cane in the Patuca valley, where it grows longer and larger than I ever saw it in Florida or elsewhere, and the stalks are softer. It is ground in rude wooden, home-made mills by the Indians and Caribs, who make their own syrup and muscovado, or heavy wet brown sugar. They also make agüadiente, or rum, from it.

VEGETABLES.

Sacoyas (Onions), beets, turnips, carrots, cabbages, cauliflower, lettuce, pumpkins, squashes, cucumbers, radishes and, in

fact, all kinds of garden vegetables, grow and thrive in the high lands on your grant. In the low, rich lands of the coast, onions, cabbages, English peas, Irish potatoes and sweet corn do not do so well, and melons and sweet potatoes are said to run too much to vines.



CUTTING A FULLY MATURED BUNCH OF BANANAS
FROM A PLANT ELEVEN MONTHS OLD.

Tonca beans, butter nuts, kola nuts and Brazil nuts can undoubtedly be grown, as I am informed by Mr. John A. Macdonald, a botanist, who was planting a Botanical Garden at Truxillo when I was there last year.

Mici (Honey). Honey bees are found all over the Republic, and the wild honey is often found in the woods. The inhabitants also raise them and hang up, generally from the eaves of the house, a hollow log, with a small hole for the bee to enter, and stopped up at the other end with clay. Honey raising could undoubtedly be made profitable here, as there are a great many flowering trees and shrubs.

CONNECTING LINES OF COMMUNICATION.

Canal From Carataska Lagoon to Tocomacho.

This is an enterprise that is probably of comparatively easy accomplishment, judging from the part of it that I examined and the statements of the natives thereabouts and maps; but I would not expect it to develop traffic enough for many years, until the country is more thickly settled, to prove a paying investment. Unfortunately the Act of Congress reserving all the coast lines, for a distance of 8 kilometers from the shore, would prevent the lands being granted, in fee simple, along the canal, but they would have to be taken in the interior. This canal would be of great convenience to our Company, as affording a safe and always available means of communication and transportation of products along the whole front of your grant, and its feasibility and cost should be ascertained as soon as the other works are completed.

Road From Wasspressni to Tegucigalpa.

According to the Map, the distance from the Wasspressni to Catacamas is 52 miles. A force of men are now engaged in the interest of the concessionists, Charles S. Babcock, C. W. Lindsay, Frank N. Wilder and William Alton, Jr., represented by Arthur H. Howland, Chief Engineer, in cutting a mule trail through the forest from Catacamas to the Wasspressni river, to open up the lands granted to them under their concession, which extends on both sides of the Patuca river from the Portal del Infierno (Hell Gate) below Catacamas to the Wasspressni, and have completed about four-fifths the distance from Catacamas. This will be of great benefit to us, as by it, in connection with our steamers, we are put in direct communication with the capital.

The distance from Catacamas to Juticalpa is 45 miles on the map published by the Bureau of American Republics. On Rand & McNally's map it is 25 miles only, which gives a very fair idea of the cartography of the Republic. There never having been any survey of the State, there can be no accurate maps. The distance given in the Census Report for 1887 is 33 miles.



NATIVES AT PATUCA.

Tegucigalpa, the Capital of Honduras, has a population of 21,872, and its elevation is 3,200 feet above the sea.

Its freight is nearly all brought and shipped *via* Amapala (on the Pacific side). I observed the freight crossing the bridge into this city from Amapala for several days, and I estimate it to be at the rate of 6½ tons per day for every day in the year, or 2,250 tons per year, for which the merchants are now paying 8.00 pesos per 200 lbs., equal to pesos 80.00 per ton, or \$38.72 O. A. (gold, counting pesos at 44). * * *

HINTS TO COLONISTS.

What One Can Do At Patuca or Rita Tara.

The occupations or enterprises in which a person can engage in a place like Patuca or Rita Tara, where cheap ocean freights can be had to any part of the world, and where the cost of living can be reduced to a minimum, owing to cheap lands, no rents, abundance of fire wood at the simple cost of cutting and hauling, a warm and healthy climate and no taxes, are of two kinds, viz.:

INDUSTRIES.

1st.—Those industries of a general class that do not depend upon the products of the adjacent locality for their raw material, such as lace making, manufacture of toys, hand-made watches, manufacture of shoe blacking, perfumery, hair oil, etc., the raw material of which is often brought from a great distance to the place of manufacture.

2nd.—Those industries that depend upon the products of the country for their raw material.

I propose to speak in detail of the last only. The production of the raw material, such as the raising of the various kinds of tropical fruits, rubber, grain and agricultural products in general, cattle and mining, have already been alluded to.

I will now mention a few of the industries peculiarly adapted to utilize the raw material of the region. The first in importance appears to me to be the *Manufacture* of fine *Furniture* and *Lumber* for cabinet work.

Squared Mahogany logs are now bringing in New York from \$75.00 to \$150.00 per M. B. M.

Vessels do not like to take logs less than 6 feet in length, and some vessels refuse to take them unless they can have a full load of that size or it is said not to pay to ship, for this and other reasons.

SAWED LOGS BETTER.

In measuring in New York, the buyers throw off one inch on each side of squared logs on account of cuts and roughness of the hewed faces and all knots, shakes, rot and imperfections reduces the measurement one-half, so it results that you have to pay freight on considerable more lumber than you can sell. The



A CACAO TREE.

export duty on Mahogany from Honduras is 4.00 pesos per M., equal to about \$1.75 gold, according to the price of silver.

FREIGHT RATES.

Mahogany cutting has always been recognized as a very profitable industry, but the cutters have always, and do now, labor

under a great disadvantage in having no harbors, except Puerto Cortez, on the coast. Ships will not go to load at Ulloa, Brewer's Lagoon, or Patuca bars at all, except in the months of May, June and July, and they then charge double rates over Puerto Cortez. The freight now from Puerto Cortez to New York is \$5.00 per ton, but 50 per cent. discounts can be had on "continuing" charters. 1 M. feet B. M. about 4,000 lbs. = 2 tons = \$10.00 per M., and double rates would be \$20.00 per M. from Patuca bar. But with the jetties built and channel opened and buoyed and lighted, the price should be no more than from Puerto Cortez.

A large number of Mahogany logs are lost annually in attempting to load them outside the bars. In walking the beach from Brewer's Lagoon to Patuca, I noticed hundreds of logs, the majority in a good state of preservation, that had broken adrift and been cast on the beach and abandoned. These logs were worth from \$35.00 to \$75.00 a piece, and could be easily saved by taking a tug-boat along the beach and hauling them off, one at a time, by means of a long line.

FURNITURE.

The advantages of a furniture factory at Patuca or Rita Tara are these, viz.: We can work up into furniture all the tops and stumps of the Mahogany and other fine wood trees, which are the best part, and which it is difficult to ship, and which are now left to rot in the woods, thus increasing the productive value of our grant, as far as timber is concerned, over 100 per cent. We can utilize in this way all the other beautiful cabinet woods, previously described, which now have no rated values in the lumber trade because unknown, and thus give them a market value and create a demand for them. We can utilize the marbles that exist on our grant for furniture (table and bureau tops, etc.), and we can ship the furniture knocked down to be put together in the States.

If U. S. import duties become prohibitory, a large trade might be built up in foreign countries. A large home trade can be developed in Central America, there being no furniture factories there, while a hand-made bedroom suit costs ten times as much as in the U. S.

The Pittsburg-Honduras Company have realized the truth of this reasoning and are now engaged in putting up a furniture factory and saw mill, to cost \$150,000, with the largest gang saws to cut the large stumps, on the Honduras R. R., near San Pedro

Sula (250 miles from Patuca), and have the machinery already on the ground, and have built a R. R. 7 miles long for hauling logs. They have a saw mill already in operation.

The most beautiful high-priced furniture in the world can be made from these now unknown woods.

OTHER ARTICLES IN THE WOOD LINE.

Such as canes, umbrella sticks, tooth and hair brush handles, gun and pistol stocks, fine carriages, carfinishing, mantles, tool handles, fine fish rods, engineers', surveyors' and architects' instruments, mirror and picture frames, counting house and bank fittings, pulleys, blocks and sheaves, cabin finishing, doors, wain-



LOADING BANANAS IN THE BOAT.

scoting, window and door frames, and house finishing generally, carving, turned goods, etc., spindles and shuttles, buttons, tooth picks, boxes, electrical fittings, barrels and kegs (to be shipped knocked down), packing cases and fruit crates (for home market), R. R. ties, etc.

Scrubbing brushes, from the palmetto, cocoanut and other palms. This is a profitable business in Florida, and there is a large steam factory at Jacksonville.

Mats, from cocoanut and other palm fibres and husks.

Cordage, twine, gunny bags, saddle bags or alforjas, hammocks, etc., from the same and the other fibers mentioned on a preceding

page. These are also made for home demand by the natives.

Ship and boat building. This industry could be advantageously carried on here, as it is on the Bay Islands, as there is abundance of the finest shipbuilding timber.

All carts, launches, oars, tow, tar, pitch, lime, Roman cement and zinc are admitted free of all duties. (Decree No. 83, Honduras Acts of 1896.)

Manufacture of Turpentine, Rosin, Tar and Pitch:

The area of turpentine forests on your grant is undoubtedly fully 200 square miles, and may be double that, and it is so intersected with rivers that the transportation of the products to the coast will be easy. I noticed several fine turpentine orchards near Rita Tara, which were also good R. R. tie timber. Trees have never been boxed. I boxed two trees and obtained a good run of gum. Labor is so very cheap that I think the production of naval stores would be profitable, more especially as prices are now high.

Lamp Black is made by burning pitch pine in small chambers and collecting the soot on gunny cloth or the wool side of sheep skins. Cheap labor and abundance of pitch pine should make this industry profitable.

The tops and stumps of the trees cut for lumber could be utilized in this way.

Varnish. The tree that produces Copal Varnish grows plentifully on your grant, and this valuable varnish and other kinds could undoubtedly be made at a profit by any one who understood the business.

Vegetable and Animal Oils. The Corozo Palm and Coyol Palm abound on your grant, and valuable oil can be made from the nuts. The former bears a raceme of nuts, that weigh 150 to 200 lbs. A concession was granted several years ago to a French Company for making oil from the former.

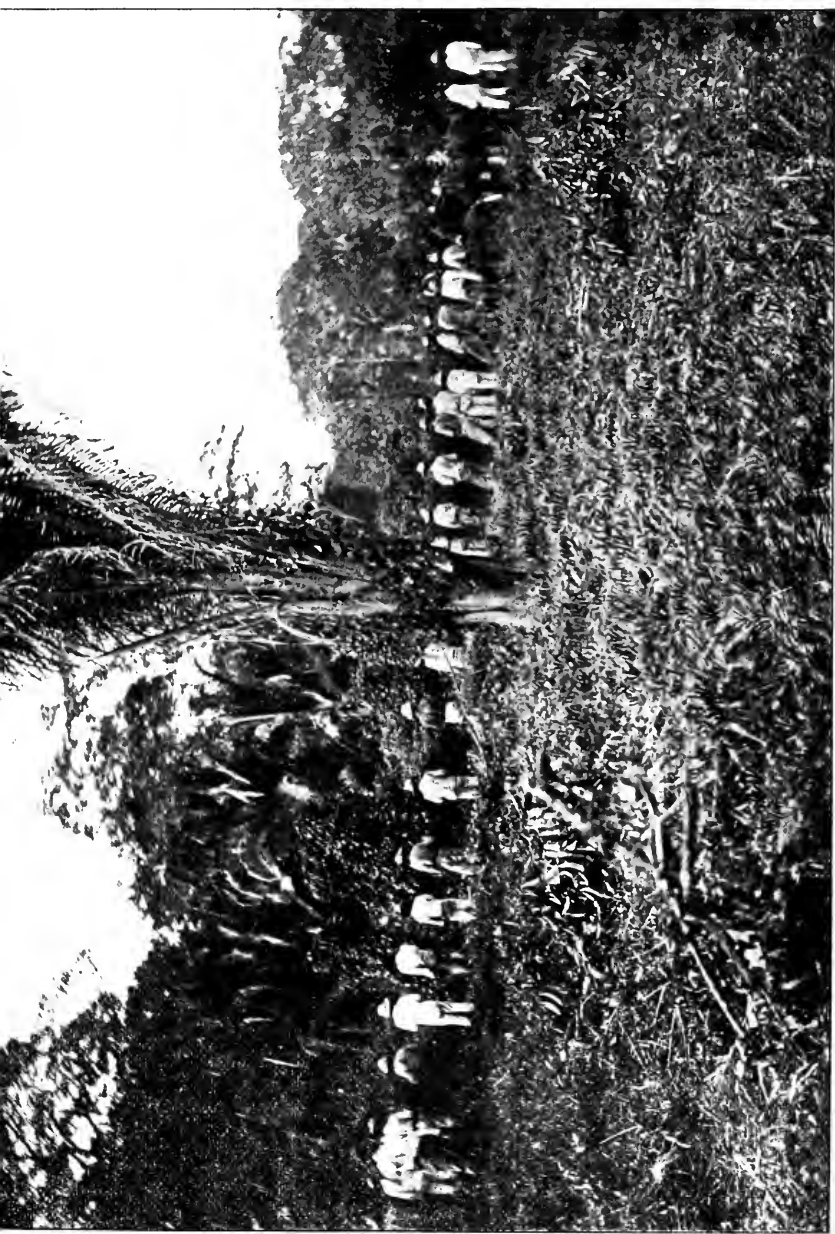
They imported their machinery, but the Manager became violently insane before the works were started, and it fell through.

Valuable oil is also obtained from the Cocoanut, as is well known.

Essential oils are obtained from orange and lemon peel, turpentine, pennyroyal and many nuts, seeds and plants too numerous to mention.

A very valuable oil is obtained from turtle eggs, which are found on the beach and in immense numbers in their season, June, July and August.

Porpoise jaw oil, the most highly prized by watchmakers, is ob-



LABORERS CLEARING NEW LAND FOR BANANA PLANTING.

tained from the jaw of the porpoise, which abound at certain seasons in the mouths of all the streams running out of your grant and all along the coast.

Train oil and fish oil can also be made from the blubber of the porpoise and from fishes here as well as in any other place, and shark's liver oil could be made in large quantities from the sharks that are numerous in the mouths of the rivers and all along the coast. A valuable oil is also said to be made from monkey fat.

Palm Oil Soap has a high reputation for use in hard water, and even sea water. This and other soaps and *Glue* can be made here.

Pot and Pearl Ash are made from hard wood ashes. There is abundance of material that can be thus utilized when clearings are being made in the forest for plantations. The Espina blanco or white thorn, gum-arabic tree, an acacia, is especially rich in potash.

Hard wood ashes as Fertilizers is largely made in Canada and exported to Florida and all over the United States. It would seem that it could be made and exported from Honduras, by ocean freight, with better facility.

Fish scrap fertilizer is largely made in New England and Florida, and could be made profitable here in connection with the manufacture of oil.

RUM.

Sugar, Syrup, Molasses and Rum. The Patuca valley is peculiarly well adapted for the making of these articles, as explained in my preliminary report. The manufacture of rum or aguardiente is a monopoly of the Government, and is extremely profitable. In fact, it is to-day the most profitable business in the country. A contract has to be made with the Government which is easily arranged. The rum has to be delivered to the Government, who pay at the rate of 23 cents in silver per bottle, or 10 cents gold, equal to 50 cents per gallon, but deduct a tax of 4 per cent. The bottles hold one-fifth of a gallon.

Estimate for a small plant is as follows:	O. A.
1 25-gallon copper still.....	\$225.00
Furnace and setting of same.....	57.20
Cane mill (mule power), capacity 5 tons cane, or 720 gals. juice	75.00
Building and fittings.....	77.00

Ferment trough	22.00
10 kegs	5.00
	<hr/>
	\$461.20
Contingencies and omissions, 10 per cent.	46.12
	<hr/>
	\$507.32
Freight, Cincinnati to New York, thence to Honduras	22.32
	<hr/>
	\$529.64

DR.

Cost of Operation. (Pesos.)

1 distiller per day.....	1.50
2 laborers per day.....	1.00
2 men cutting per day.....	1.00
3 men boating per day.....	1.50

	<hr/>	O. A.
Cost per day.....	5.00 pesos =	\$2.42
Wood		1.25

	<hr/>	\$3.67	
Contingencies, 10 per cent. ....		.37	O. A.
		<hr/>	\$4.04

CR.

Make 4 distillations per day, 25 gals. each. . . . 100 gals.
 50 per cent. spirits. 50 gals.

or $50 \times 5 = 250$ bottles, at .23 pesos, \$57.50 = 25.30

Net profit (per day)..... \$21.26

Cost of Cane Patch Per Acre. O. A.

Clearing (without grubbing)..... \$3.84

Planting (4 ft. apart) 3,025 plants..... 1.30

3,025 joints of seed cane at 1 centavo = pesos \$30.25. 13.31

\$18.45
 1 cleaning per year..... 2.00

Total \$20.45

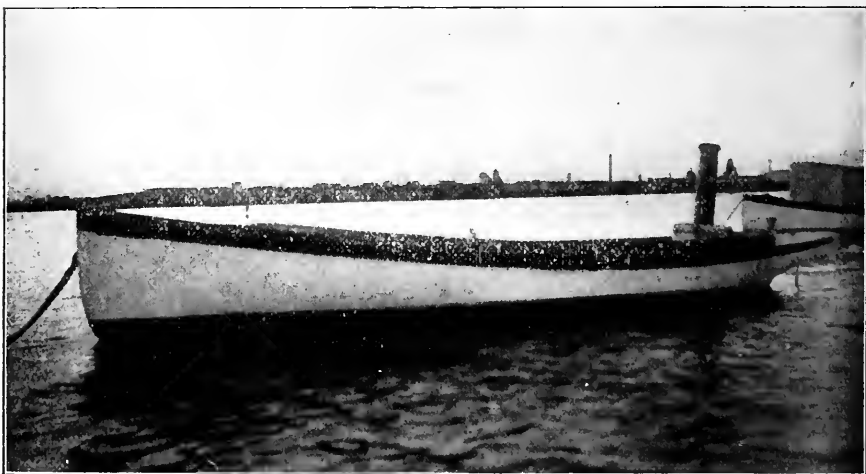
Grubbing is not necessary, and is never done. After first planting it will continue to ratoon or grow from the root for 12 to 15 years, and requires no cultivation.

Twelve acres of cane will supply 100 gallons of juice for distilling, daily, for 6 months.

The cane of Honduras is said to be richer in alcohol than any other in Central America, and will prove at least 36 per cent. The rum has only to prove 21 per cent. when delivered to the Government.

Honduras has an annual income of 800,000 pesos from this source. Salvador 2,600,000 pesos and Guatemala 3,500,000 pesos, a peso being worth at this time 44 cents. Manufacturers are allowed to retain what they need for their own use and for medicine. This business is considered perfectly respectable in Central America, and a former President of the Republic was engaged in it.

The manufacture of lime, cement, brick and tiles has already been alluded to.



LAUNCH "LOUISE."

Pottery. Kaolin clays, suitable for fine pottery making, I discovered on your grant at Savannah, or Waxma, in inexhaustible amount on the Patuca river. This industry could be made an important one. The Indians make a rough but serviceable pottery universally used in the Republic.

Glass Making. It is probable that this industry might be developed near the coast, as at Patuca.

Fuller's Earth exists at Gualpitanti, as I discovered. This can be mined and used for refining the oils made, or can be exported.

Mineral Paint Making. I found a good quality of Chrome earth near Crupunto, and the manufacture of paint here should be looked into.

Flour and Meal. Wheat, rye, barley and oats can be raised on the elevated lands of your grant, and corn everywhere, and the manufacture of flour, meal, grits and cornstarch could be made very profitable, with an assured home market for all the product.

There is a brewery at Tegucigalpa which would furnish a market for considerable malt.

The Government is anxious to encourage this industry, and will give substantial assistance.

There are now but three or four small flour windmills. This could be made one of the largest and best paying businesses in the country.

Banana and Plantain Flour. Settlers on the Patuca river will be exceptionally well situated for engaging in this business.

STARCH, ARROW-ROOT AND TAPIOCA.

Starch is made from the Coonti, or Arrow-Root, and from Cassava, or Yuca, and could also be made from green bananas and plantains. The cassava is raised by all the Caribs, but I did not see any coonti growing in the country. It grows wild in Florida, and could easily be introduced to Honduras. The manufacture of starch from it affords occupation to many poor people in Florida, as the process is very simple and requires no capital.

Tapioca is made from starch by heating on flat iron surfaces. There are several varieties of starch, viz.: edible, laundry, and medicinal.

Corn Starch is made from corn. The Government of Honduras is very desirous of introducing this industry. A great deal of corn is grown in the country, and it would materially assist the manufacture.

CANNED GOODS.

Canning Fruits. An outfit for canning fruit costs very little (\$150.00) and the business is easily learned. Our own lands will raise the sugar required, and a great waste of bananas can be prevented by canning, because the steamers will not take less than 8 hand bunches and all smaller bunches go to waste. They are canned in milk. Canned pine apples have a place in all grocery stores and canned guavas are extensively introduced in the south of the United States. There are also all the large list of delicious tropical fruits, that, being too perishable, can never be sent to

market. Being canned they could be held over, and shipped at any time, thus being entirely independent of market fluctuations. Also peaches, apricots, beans, tomatoes, corn, sapotes, mangoes, bread fruit, etc.

Canned Fish and Meats. I believe that the canning of mullet, drum, sheep head, rock fish, king fish, grouper, Spanish mackerel, crevalle, rovalle, barracouta, etc., in large cans, holding not less than from one to five gallons, would form a desirable addition to our food supply and should not cost any more than fish preserved in salt and be much more healthy and palatable.

The above mentioned fish and porgies, jew fish, eels, jack fish, catfish, bream, big-mouthed bass and cuyamel, or carp, abound in greater or less quantity in the waters of your grant and the adjacent shores.

Turtle eggs, green turtle and loggerheads, the latter often weighing 300 to 400 pounds, game such as wild duck, wild turkey, venison, wild hogs and beef, could also be canned. The Indians have a large number of fine cattle, and game is abundant.

Extract of beef can also be made.

Essences from fruit, such as lemon, pine apple, vanilla.

Jellies and Marmalades, such as guava jelly, which has a deservedly high reputation and price, orange and mango marmalade, mango, peach, quince, grapes, etc.

Chocolate is made from the cacaonut (not cocoanut).

Raisins.

Wine, from grapes and oranges.

Lime water, or juice from the lime fruit, a member of the citrus family, which is grown with the greatest ease. It has a large sale in the Navy and for vessels on long voyages.

Dried figs and dried bananas and plantains. Very nice. The latter are sold in the market at Tegucigalpa.

Honey.

Grinding and putting up *Pepper, black and red*.

Bay Rum, from leaves of the bay tree, or bastard mahogany.

Pickles, from cucumbers, mango melons, water melons, cauliflower, beans, red peppers, tomatoes, onions, etc.

Tomato Catsup.

Pepper Sauce, from the Spanish, or Bird red pepper.

Tobasco Sauce is also made from the red pepper. This comparatively new and popular sauce is simply strong red pepper, ground up in vinegar. It brings a good price.

Ink, from oak galls. Indelible ink made from juice of banana stalks.

Charcoal, can be made from the tops of lumber trees, and the trees cut down in making clearings. A great deal is called for in the mines.

Pickled Limes, from the lime fruit.

Vinegar, from apples, pine apples, and oranges.

Medicines, from copaiba, sarsaparilla, tania, pine apples, oranges, limes and numerous medicinal roots. A remedy for dyspepsia, is made in Florida, from small and unsaleable pine apples, which has achieved a good and extensive reputation and has developed a large and profitable, growing business.



CUTTING BANANAS.

Tonics are made from orange, lemon and lime juice and also quinine or chinchona bark and quassia.

Salves and ointments, from the Peruvian balsam, guaiacum, and other medicinal gums, gum arabic, etc.

The field for these things is almost illimitable.

Perfumery, from vanilla, orange blossoms, etc. Also from alligator and wild hog musk. In Florida the manufacture of perfumery from orange blossoms, roses, etc., is a good business.

Fish scale jewelry and artificial flowers are made in Florida from fish scales, which have gained quite a reputation, and when well made are really pretty and sell well.

Buttons, from shell, bone and hard wood.

Quill tooth picks, from wild turkeys, cranes, herons and pelicans.

Hats are extensively made in Honduras by the Indians from "pacha" (Spanish *paja*), a kind of grass, and also from "junco," a kind of hemp. Also from palm leaves. The last are made in Florida also, and are very durable and strong.

Matting, called *petate*, is made from a different kind of straw or grass, called in Spanish "*paja para petates*." This matting is universally used on beds and largely for floors, and looks very neat.

Cloth, woolen and cotton, is made quite extensively by the Indians of Guatemala. They raise their own sheep, prepare the wool, make their own dyes, looms, etc., and turn out a very fine quality of cloth, of which fine shawls, blankets, cotton sheets, clothing and wool suits are made.

Silk. Silk worms are raised and a fine quality of silk cloth is made by the Indians of the neighboring State of Salvador, from which the same Indians make very handsome silk shawls (*chalis* or *panuelones*) and handkerchiefs. These industries can be inaugurated at Rita Tara.

Baskets, of many kinds, are made by the Indians of Honduras and are well made and pretty.

Tanning. The natives of Honduras make a great deal of cowhide leather, both sole and upper, of a good quality, and various kinds. This business could undoubtedly be made a large and profitable one. There is plenty of oak and sumac (see art. on woods) and other trees valuable for tanning.

Deer, hog and alligator skins can be procured in abundance for tanning. Deer skins form a large article of export, and alligator skins might, but no one has embarked in the business. The value of alligator hides is well known. Deer skins can be bought in Honduras for 25 centavos per lb.

Shargren, or shark's skin, can be collected and prepared for shipment all along the sea front of your grant. Among its other uses, it makes an excellent sand paper.

Purpoise skin is considered to be valuable for water proof boots. It can be collected and prepared at the mouth of all the rivers and in all the lagoons.

Shoes. Several varieties of shoes are made in the State, durable, well made and comfortable, and some not at all bad looking. All made from native tanned leather. An up-to-date steam shoe manufactory should be a good business, for the home trade alone, as leather is very cheap. Flint cow hides can be bought for 40 cents gold and tanned hides for 5 to 5½ pesos.

Saddles and Leather goods. A great many very fine saddles are made in the State, as all traveling is done in a saddle or on foot. They cost in Tegucigalpa from \$12.00 to \$45.00 (silver).

Dyes. Numerous dye-woods exist and the manufacture of dyes from them would not be difficult.

Soap. A very inferior article of soft soap is the only kind made by the natives. The Government would undoubtedly aid the establishment of a modern soap factory in a substantial manner.

Paper making, from wood or other fiber, could be inaugurated



VIEW OF PATUCA RIVER NEAR WAXMA.

here, with success, I should judge. There is no doubt but that the Government would subsidize it liberally.

Sand Paper could also be made.

Candles are made in the country from native tallow and are almost universally used to the exclusion of lamps.

Deer and cow-horn goods, such as ornamental pieces, hat pegs, combs, knife handles, etc., would find plenty of raw material.

Pumice-stone polish. Large quantities of pumice-stone is cast

up on the beach along the front of your grant, which could be easily collected and manufactured or shipped in pieces, as found.

The United States imports \$40,000 worth of pumice-stone per year.

Manufacture of Rubber-Goods. The Indians make rubber blankets or sheets, bags, ponchos and pouches of native rubber, sometimes using native-made cotton cloth to spread it on and sometimes imported cotton. The color is a brownish yellow, and it is preferred by all who have used it to the article made in civilized countries, as it is more durable, does not crack and is more thoroughly water proof.

It is not impossible that its manufacture might be improved by coloring, or in other ways, to prevent its melting and sticking together in the sun, when folded, which is the only objection to it as now made.

Salt, is manufactured at San Lorenzo, on the Bay of Fonseca, from sea water, and could be made at Patuca in the dry season. There is a large demand in the mines.

Salting and smoking Fish, Beef and Venison. This business could be carried on at Patuca, Carataska Lagoon, Brewer's Lagoon, Rio Negro Lagoon, and the other river mouths on the coast for fish, and at Rita Tara for beef and venison. The natives salt and dry the two latter in long strings about an inch wide and thick and sell it by the yard. In salting fish in warm climates precautions must be used and the back bone must be taken out.

Tobacco, Cigars and Cigarettes, Manufacture.

(See article on tobacco.) Tobacco raising and exportation is free. This business would pay well in the hands of those skilled in curing it.

Smelting and Ore Reduction Works. Works of this kind could be established on the upper Patuca, say at our Wasspressni station, which would receive the gold and silver ore (also copper, iron, etc.) by water carriage from the placer and lode mines, located higher up the river and its branches. This work would probably largely increase after the opening of the Patuca bar, allowing heavy mining plants to be brought up the river.

Broom Making. Broom corn is raised in Florida, and the manufacture of brooms is a new industry there, and it probably could be raised in Honduras.

Collecting. Collectors of Specimens of natural history, such as birds and animal skins, animal skeletons, fishes in alcohol, insects, lizards, sea shells, etc., would find here a prolific and varied field, with probably many new species yet undescribed. The



PLANTATION SCENES.

Quetzal, or sacred bird of Guatemala, otherwise known as "amazana" or dracon, is found in the mountains throughout the country, and brings a large price in the States, and many other rare and beautiful birds.

Collectors of plants will find many very rare and valuable orchids, tree ferns, palms, vines, cacti, etc.

Collectors of medicinal plants, gums and roots have a large field, as explained in previous articles.

Collectors of plumes and hat birds will find great varieties in great numbers, especially of the latter. Egret and heron plumes sell for \$20.00 per ounce in New York.

Collectors of furs will find Otter (or Water dogs), Raccoon (or Pisote), Tiger, Mountain Lion, or Jaguar, Ounce, Ocelot or Leopard, Panther, Deer, Monkey, Opossum, Fox, Coyote, Skunk, etc.

Collectors of Curiosities will find a great many novelties (carved cocos and jicoras), sea beans, sea fans, carved pillars, sculptures, heads, monkey ladders, Indian curiosities, native tooth brush, wild Indian zozodont, Indian washing blueing.

Manufacture of Persian Insect Powder. The plant from which this powder is made is now being extensively grown in the Southern United States and the powder made there. It fills a great demand there and would here, where fleas and other insects are numerous and troublesome. Owing to the high duty and mule back transportation it costs \$5.00 gold per pound in Tegucigalpa, against 20 cents in United States.

Mattress and pillow making. These can be made from the Spanish moss (*Tillandsia*) which is found plentifully draping the trees in many mountain regions, or from the Pine needles, tree cotton or common cotton. The Spanish moss mattress manufacture is a large industry in Florida, and a great deal of the moss is shipped north in bales, and its collection and preparation provide employment to thousands of men, women and children, all over that State.

The Hondureans never use mattresses on their beds, which are without any doubt the most uncomfortable and primitive affairs to be found in any civilized country.

Rustic-Furniture making. Many vines and odd tree growths are found in this State, and this industry would find plenty of good material to work with.

Bamboo kegs, bottles, pails, pipes, etc. These are made by the Indians by simply cutting off a section of the bamboo trunk, large trunks making kegs and small ones bottles. They are sometimes carved and ornamented. It is only necessary to bore a hole in one

end or the middle and the keg or bottle is complete, the inside being perfectly hollow and air tight. Kegs and bottles enough to freight 1,000 ships could be cut on the Patuca river and branches. They are light, do not break when dropped and require no hoops. I think they would prove very acceptable when once introduced into the market, if turned and painted in an ornamental manner.

Bamboo Fence Pickets. These can be easily split from the trunks and are light and strong and quickly made and much used in some places.

Dairy, Milk, Cheese and Butter. There will be a constant home demand for these articles, at Patuca, Rita Tara and Guaspressni, and cream cheese and butter could be canned and exported. As before remarked, this region is pre-eminently a cattle raising country, and large herds, belonging to the Indians, now roam



GROUP OF NATIVE HOUSES.

over it. The cattle are of good size and fat, but the cows do not give much milk, one gallon being considered about the top limit of milk at one milking. The breed should be improved by the introduction of Jerseys and other good stock. Hondureans will not eat American or foreign butter, considering it too greasy.

Gardening, to supply the workmen and visiting vessels with fresh vegetables, would be profitable, as already said.

Bakery. Housekeepers in Honduras cities never bake their own bread, but purchase from a professional baker.

To supply our workmen at Rita Tara and Patuca 2 bakers would be required.

Butchers. Two will find employment as above. There are no butchers in Honduras and such things as Sirloin, Porter House

and Tenderloin steaks are unknown. The meat is cut up in strings and chunks and all fat cut off. Although a great many sheep are raised in the country, lamb or mutton is never seen in the market or on the table.

BUSINESS GIVING IMMEDIATE RETURNS AT PATUCA.

Immediate Cash returns can be obtained by the Company or Colonists taking up the following lines:

Hauling off from the beach and selling the mahogany logs previously spoken of.

Cutting and shipping mahogany and other valuable lumber.

Getting out sticks for canes and umbrella sticks and special woods for brush and tool handles, gunstocks, carriage woods, engineers', architects' and draughtsmen's instruments, picture and mirror frames, etc. Collecting and shipping sarsaparilla, and other medicinal gums, roots, balsams, etc.

Cutting and selling dye-woods.

Collecting rubber.

Making rustic furniture and bambco kegs and pails.

Digging and shipping Fuller's earth.

Making mineral paint.

Making turpentine, rosin and tar.

Collecting and selling skins, hides, bird skins, orchids, etc.

Collecting and selling pumice stone.

Making fertilizers, fish scrap and hard wood ashes and shipping them.

Buying from the Indians and shipping bananas.

Buying and shipping cattle.

Making aguardiente or rum, on a Government contract, on small scale, buying the sugar cane from the Indians.

These industries could be prosecuted while the improvements are going on and while they would be more or less handicapped until the bar was opened, as has been explained in the article on furniture making, it is believed they could be carried on at a profit and afford a considerable cash income from the start, if energetically prosecuted and the markets properly canvassed and orders placed in advance.

I have no hesitation in saying that I believe a net income of \$40,000 can be realized the first year from these industries, which should be increased to \$100,000 the second year, provided the necessary capital is furnished for their exploitation.

In concluding this report I desire to say, that with a somewhat extended acquaintance with different countries and climes, ac-

quired during 30 years' practice and travel. I have yet to find a country better suited to sustain a large and prosperous population, or one more delightful for a residence or more healthful.

Embracing, as your grant does, all varieties of soil, topography and climate, from the low, hot and swampy lands of the coast, to the tops of the mountains whose summits are 5,000 to 6,000 feet above the level of the sea, he would be indeed a difficult person to please, who could not find in this wide range of level prairies, roll-



PINE TREES AT RITA TARA, PATUCA RIVER.

ing knolls, the wooded slopes of the colinas and lovely emerald gems of valley's embosomed among the towering peaks of the majestic mountains, a quiet dell for a home or sufficient broad acres for a plantation, whose boundaries would extend beyond the sunrise and the sunset.

Your port of Patuca is but the gateway, the porter's lodge of this veritable Eden. It is a necessary adjunct to your domains.

but excepting those whose business requires them to reside there, colonists will find little to attract them to Patuca, the vicinity being mostly low and swampy; but all up the river between Rita Tara, Gualpitanti and Wasspressni, we find lands high, fertile, slightly and healthy, where the most delicate constitutions can be invigorated and built up, and where, as one ascends the mountain slopes to the upper plateau, it will be found a luxury simply to live, to breathe the pure and invigorating air and to drink the cool and limpid waters tumbling down the slopes and ravines in sparkling cascades.

At these elevations (3,000 feet and over), two blankets will be found comfortable at night and spring overcoats at night in November, December and January.

This is not a fancy sketch. Words, however, fail me to adequately describe this country. I have examined and described it on the cold and uncompromising basis of facts, from a professional standpoint, that weighs all the natural conditions and resources, pro and con, preferring, when possible to quote the descriptions of others, made independently and unconnectedly at different times, as perhaps possibly more unbiased than my own.

I desire to express my thanks to (besides those mentioned in the body of the report) Dr. R. Fritzgartner, Ph. D., Government Geologist, for the loan of valuable publications of which he is the author. Also to Don E. Constantino Fiallos, C. E., Minister of Public Instruction and Justice, for documents and facilities presented. Also to Mr. Henry A. Spears, E. M., for many valuable reports and data on mines, etc., and to Mr. F. H. Mills, Mec. E., Don Luis Loewner, Dr. John Gilman, all of Tegucigalpa, for various data, and to the Director of the Government Library, Senor Bermudez Castro, for facilities submitted.

Respectfully submitted,

(Signed.)

J. FRANCIS LEBARON,

CHIEF ENGINEER,

American-Honduras Company.



BANANA PLANTS ONE YEAR AFTER PLANTING.

NOTES ON THE PATUCA VALLEY.

From Article in *Harper's Monthly*, by Samuel A. Bard.

"There are ruins of English occupation on a small island in Criba Lagoon, and at the mouth of Poyas river a Sambo settlement. Scenery here is beautiful, trees and small shrubbery dotting the Savanna in a picturesque manner. Red pitch pine abounds here, from which the former settlers obtained considerable tar and pitch. There is an old sugar plantation about 18 miles from the mouth. The river Poyas is navigable for small vessels 50 or 60 miles.

"Campamento is 1,700 feet above sea level. Headwaters of the Guayape yield about \$600,000 gold a year. Yoro and Olancho furnish \$150,000 per year, solely by hand washing. As worked in California these placers would yield at least \$6,000,000.

"*Valley of Lepaguari* is a plain with girdle of mountains; a park of verdure springing from a deep rich soil, wide enough to sustain the population of a commercial and agricultural State. Temperate in climate and free from the local fevers and miasma of our Western States, it is capable of giving full occupation to thousands of adventurous emigrants who would here find homes and healthful remunerative occupation.

"From Juticalpa to the sea is 220 miles by canoe and navigation is available for steamers of light draught at all times of the year. The sun sets to music in Olancho and the air breathes sounds and delicious odors. His native land appears to him (the Olanchano), as to others, an earthly paradise. Without labor he is rich, without art he is free from disease.

"A summer in the interior of Honduras brings with it such luxuries of air and scenery as can be enjoyed in no other part of the world. The summer or wet season is not, as many suppose, a continued fall of rain. A succession of quick showers and thunder storms with intervals of brilliant sunshine make up the season. The rain will fall all night in torrents with lightning and thunder and wind, alarming but not destroying, and then the sun bursts through the clouds of morning over a landscape richly and

tenderly diversified with green and gold. A warm air charms the senses; the eyes are pleased but not dazzled with rainbow tints reflected by the glittering moisture of the foliage and the curtain work of silver and purple clouds, fading gradually as day advances, makes these lovely pictures seem near and familiar to the beholder."

Five million dollars of silver went every year from Tegucigalpa and half a million of gold dust from the Guayape (Patuca).

The placer region proper extends from the headwaters of the Guayambre and Segovia rivers in a northeasterly direction as low down as *Corte Lara*, the mahogany cutting of Señor Ocampo, on



PLAZA, TEGUCIGALPA, WITH WING OF PRESIDENT'S
PALACE IN BACKGROUND.

the Guayambre, thence in a north and northwesterly direction along the foothills of the Campamento range to the headwaters of the Tinto or Black River. The general direction of the great cañons and ravines is towards the northeast. The northeast trade winds blowing from the Caribbean Sea and the Bay of Honduras, send waves of air loaded with the moisture of the sea and rivers along all their valleys, and these waves reaching a cooler region deposit a vapor which keeps the valleys on the eastern sides of the Cordilleras perpetually green, while the western and southern

slopes (on the Pacific side) are parched with the dry winds of winter. It is this feature of Central and Eastern Honduras which confers upon it such unrivaled salubrity and beauty.

I could not visit all the localities of gold dust, not even all of those which are well known. The most celebrated of Lepaguari are Los Almaciguerras, the Espumosa, the Murcielego and Las Marias. The general wealth of these, and some far richer but less famous localities which I visited, is fully equal to those I saw worked by successful miners in California, not by sudden yields of lumps or lucky strikes, but by the average for a year or two years' labor. Two cents to a bucket of earth will make the fortune of a company which will continue to work.

As for sudden yields I saw several and was lucky enough in the one or two experiments which my duties as a topographer and negotiator allowed me to make. Half an ounce is not infrequently taken out in an hour, but this is too rich for continuance. The experienced miner relies upon his average, not for weeks, but for months and even years.

My visit to the bar, or deposit called Murcielego, in English the "Bat," was well timed and gave me an opportunity of observing the lavaderas at work.

A few women were washing on the bar when we arrived. The river was in a favorable condition and at a medium height. The lavaderas worked slowly and stupidly, performing about one-third as much labor each as an American miner. I saw taken out from one to two and three cents of gold to the pan of earth, in rare instances five cents to the pan, which is a good yield.

One cent to the bucket of earth pays in California where expenses are heavy. The particles were not scale-like but round or irregular and polished by attrition. Pieces weighing five and even eight ounces have been taken from this bar. The General led me to a shallow excavation on the upper level of the bar, which is reached by the river only during a freshet, at least 20 feet above low water, where his lavaderas took out several pounds of gold in the course of six days' washing. American miners would dig deep and attack the ledges.

During our return I noticed for the hundredth time the regularity of form that give these hills their unequalled beauty. With an even almost insensible gradation, range beyond range, west, north and south, rises an amphitheatre of grassy elevations, wood crowned eminences, aspiring hills, lofty ranges, and, further still, peaks of such a blueness they seemed solid ether, as though the liquid atmosphere had been mixed with light and crystalized in airy glaciers.

The hour of sunset at this season banishes all but sensuous and poetic emotions. All is softened and tinted with gold and azure. The pure air elevates the spirits and clears the lungs. The voice



BANANA PLANTATION NINE MONTHS AFTER PLANTING.

deepens, muscular exertions become easy, almost unconscious. You will find yourself enjoying the most delicate pleasures of

perception and poetic emotions flow in upon you at every step. Nothing is more absurd or farther from truth than our popular dread of "these unknown regions under the tropics." The sandy horrors of Sahara or Colorado are not here. Here the sun neither scorches the skin nor dries the blood: the earth is warm but not infectious. Throughout all the new countries of our own western States the local unhealthfulness is prevalent and hard to be resisted, even by good constitutions. I found nothing of this influence in Olancho. On the sea coast where there are marshes, the heat of summer breeds bilious fevers, but even at the mouth of the Patuca, along the shores of Brewer's and Caratasca lagoons, at Cape Gracias á Dias and as far south as the Bluefields River, fevers are slight and not so prevalent as on the Ohio and Mississippi rivers.

The eastern coast of Central America north of Cape Gracias á Dias, is uniformly healthy, excepting at a few points where there are miasmatic flats, hummocks or marshes. From the cape as you sail northwest the coast becomes higher and from the Patook (Patuca) to Trujillo ranges of hills come down nearly to the sea. Beyond Trujillo again there are a few decidedly pestilential localities, but the major part of the northeast coast of Central America is superior in salubrity to any of the West India Islands, except perhaps the Bahamas.

Work may be done at all seasons of the year in Lepaguari in the open air, and as the rivers are rarely dry, because of the constant moisture condensed upon the interior mountains by the trade winds, gold washings on wet or dry diggings, may be carried on without interruption by well organized mining parties. When the river is low on the Espumosa after the subsidence of a freshet, the lavaderas wade into the torrent and bring up gold sand and pebbles of remarkable richness. As there are no washings above this point until we reach the beginning of the next cataracts, it is presumed that an unusual deposit of the precious metal has been made here by the action of the torrent continued for a long period of time. It is the intensity with which nature works—producing, in close groups, every form of vegetable life—that gives its peculiar beauty to this region. The grass and trees look fat with sap, and ready to burst their rinds. The solidest and tenderest, vegetable ivory, and cork; the cocoanut and banana; the grape and guava; gum of Arabic and barley of the North; the most delicate of perfumes and the ill-scented but useful India rubber; mahogany and pitch pine; rosewood and common oak; frankincense and anise; cedar and logwood; all the vegetable utilities have made their home in Lepaguari. There is not a conceivable work of

human hands which may not be executed here, with materials formed upon the surface, nor a month of the year when the workman may not proceed; nor a day too hot or too cold; nor a taint in the atmosphere, nor any indigenous or imported pestilence.



SHOWING WIDTH OF THE PATUCA RIVER.

The traveler is bewildered with the richness and splendor of all that meets the sense.

Here is no African desolation, no horrors of an Italian Campagna: the soil reeks with gold, the rocks are tenacious with

silver. In one quarter fiery cinnabar, looking like a mouldered brickpile, thrusts forward its mercurial red; reminding you of uncounted millions of liquid treasure, and above it the humble and useful pitch pine offers itself as food for the artisan's fire. The wealth and power of an empire lies here asleep, like night upon the hills, and needs only that those heralds of civilization, the northern miners, should awaken it into a brilliant life.

Imagine the vegetable and mineral wealth of New England and Virginia intensified tenfold; the same genera of plants and trees, American in tint and physiognomy; our own northern June greens and September browns, alternating with the same familiar evergreen tints, but closer, firmer, softer, richer and more varied and expanded in every way. It is the New World at its best, its summit of beauty and utility. The aphorism of Lord Bacon that knowledge is power, and, by converse, that ignorance is weakness, exemplifies itself in the ignorance of the American people regarding the real character of the interior of tropical America. A young gentleman, whose knowledge of these countries has come principally from the traveling menagerie and the picture books, associates it only with horrid serpents, destructive tigers, poisonous spiders, and an air reeking with death in every form. He has not learned that the white and grizzly bears of the North, the panther of the West, the rattlesnakes of Virginia, and the fever of the prairies, are far beyond any of the dangers of that class to be met with in interior Honduras. The treeless hills of California offer no sustenance to the traveler. In the swamps of Pennsylvania, Lieutenant Strain's party, without food as they were, would have perished to a man. I have lived for months in Olancho without seeing a mosquito, and, I believe, but one tarantula or poisonous spider. I could not, without great trouble and expense, have stocked an ordinary museum with stuffed monsters. The country is old, and nature accustomed long ago to civilization. Centuries ago it was inhabited by the wild, uncultivated aborigines of Central America. To these came the Spanish Caballeros and established their slave system, mines were worked, fields cultivated, cities built; the interior of Honduras became a treasure house and a garden.

Lepaguare, with its beautiful rivers, the Almendarez, Garcia, Chiflingo, Moran España and Guayape, is truly a desirable land; nor do I deem it probable that Americans going into this thinly inhabited region will degenerate by reason of the air, or of too great wealth of soil. Over fields teeming with gold, the Yankee man cannot resist the temptation to labor; and it is my firm conviction that in Olancho alone, of all tropical America, the prob-

lem of colonization, by the industrious and frugal citizens of North America, will be peacefully and effectually solved. The hills crowned with foliage, and the plains covered with deep grass, preserve a constant moisture in the earth. The trade winds, blowing at all seasons from the ocean, temper the air to a delightful mean. At Juticalpa the mercury in the hottest weather of summer seldom rises above 95° of Fahrenheit, and my own thermometrical tables, kept during the fall and winter seasons, never fell below 52° , and only once rose above 82° , the best medium for health and exercise. My observations of temperature



LOADING BANANAS IN HONDURAS.

were made daily, three times a day, from September 27th to January 15th. At six o'clock in the morning, observations made from December 16th to January 15th, showed an extreme variation of only nine degrees, 52° to 61° . Noon observations for the same days showed the same variation 72° to 80° . The morning temperature at Lepaguare was about 50° , the noon 78° , the evening about 74° , for the winter season. It has never been known as hot at Juticalpa—during July and August—as is frequent at New York and New Orleans. The temperature of Lepaguare is probably finer and more equable than in any other part of Central

America. The reasons for this are geographical, and do not apply in general for the tropics. At Truxillo the heat is distressing and bilious fevers and dysentery are as common as in New Orleans, but not so fatal because of the better location of the place.

Vanilla vine trees abound in Olancho and support the vines which produce qualities of vanilla finer than any that is brought to the United States. I found the vine which bears the pod, or bean, growing parasitically, extracting its nourishment from the bark of the tree to which it clings.

My very excellent friend, Opolonio Ocampo, the enterprising mahogany cutter of Patook (Patuca River) represented to me that Bernadis did not half know the importance and advantages of the Patook. Ocampo has passed the bar at all seasons and finds the river entirely navigable for its whole length. Under the head of "Tes oros en Olancho y Santa Cruz del Oro," Bernardis writes nearly as follows:

"The world is generally well informed in regard to the mineral wealth of California, Australia, and the headwaters of the Amazon. These discoveries originated in the eagerness of commercial nations to accumulate wealth by colonizing new countries, and were not owing merely to the intrinsic value of the regions themselves. It may be affirmed, without exaggeration, that nearly the entire State of Honduras is enriched with metallic veins, and conceals in all parts of its territory, treasures which demand only a superficial exploration for their development. The scarcity of labor, the depopulated condition of the country, the want of mineralogical knowledge, of capital and of mining adventures, and above all the peculiar inertness and indolence of the Spanish-American people in all occupations which require physical labor have prevented the enjoyment of this natural wealth.

"The departments of Olancho and a portion of Santa Cruz del Oro (called also Yoro), are naturally the rivals and equals of the California placers. The rivers Guayape and Jalan, which form the Patook (Patuca) River, by their junction at Juticalpa, about 95 miles southeast of Truxillo, bear in their waters sands of gold collected along their entire course."

The bar of the Patook (Patuca) River, lat. $15^{\circ} 48' 30''$ north and long. $84^{\circ} 18'$ west of Greenwich, is an entrance over which vessels of deep draught cannot pass with safety, the depth of water varying between five and eleven feet according to the season and state of the river. From the bar to the confluence of the Guayambre, a distance of sixty miles inland, in a southwesterly direction, as the crow flies, the least depth of water is from two to five feet as far as the Chifflones or rapids; above which is the

junction of the great river Guayambre, which comes in from the southeast, taking its rise in the mountains which divide Nicaragua from Honduras. From the confluence (La Confluencia) to the mouth of the Jala, the depth is $3\frac{1}{2}$ feet to four feet without obstacle, through a level country, to a point five miles below Juticalpa, above which are placers or gold washings extending over a region between seventy and eighty miles in width.

The depth on the bar at mouth of the Patuca River is actually eleven to twelve feet in winter and six to seven feet in summer. The variations are due to storms and freshets.

"The gold of the Guayape, Jala and Mangualili rivers is well known in Olancho, as are those of the Sulaco, Yugale, Caminito and Pacaya in Yoro. Some of these streams are of the richest order of rivers, and compare well with that of Copai and Guasco in Chili."

At a later period I made a personal survey of the great river Guayape (Patuca). During my sojourn in Olancho it was a formidable stream, flowing majestically towards the sea, fed by numerous mountain affluents, the Jala, Guayapita, Concordia, España, Moran, Garcia, Rio de Olancho, Masatepe, Rio Real, Rio de Catacamas, and the lesser Tinto. Below Juticalpa the Guayape, now called Patook (Patuca) increased by the Guayambre from the south southwest, and then successively by the Gineo, Rio de Tabaco on the south, Coyamel, Wanpeo, all large branches with numerous smaller tributaries, becomes an immense stream, capable of bearing the steamers of the Upper Ohio and Mississippi upon its bosom. During the rainy seasons or summer months, the body of water rises to twice its ordinary depth and spreads into vast reaches, "sloughs," and fresh water lagoons. When I visited the Chifflones I found four feet of water on the rapids, and could discover no obstacle to steamboat navigation, as it is now practiced on our western rivers, from the ocean to the immediate vicinity of the placers, above the Jala."

OTHER EVIDENCE.

Cecil Charles, a well-known writer, who spent fourteen months in Honduras studying its people, climate, natural resources, etc., etc., says, in a book published by Rand, McNally, & Co.:

"A great many people have a terrible dread of Honduras as an unhealthful place. For the most part, such a feeling is unwarranted. It is certainly a wise plan to go at once to the interior on first arriving in the country. But the coast lands are by no means such deadly regions, providing one exercise proper care as

to living. Wait until you have been two or three weeks in the tropics before you eat fruits to which you are unaccustomed. Be careful not to drink impure water without first boiling it. There is no danger in the water of the crystal clear mountain streams. Avoid getting wet and chilled. If you get caught in the rain, take immediately a little brandy. Do not eat too much animal food; if you do, you are apt to become bilious. Be temperate in the matter of liquors. The aguardiente of Honduras is very powerful, and should be taken sparingly. The guaro is better in the bottle than down the throat.

"No one who has been in Honduras can be unaware of the perfection of the climate of the interior in restoring health to those suffering from disease of the respiratory organs. The pure and gentle atmosphere of these high altitudes is the best possible cure for consumptive tendencies. Persons, indeed, whose lungs are already seriously affected, may hope for complete recovery here among these upland forests of pine and oak. For such, an altitude of three to four thousand feet is the best region. In this cool and even temperature they should wear light flannel under-clothing and sleep with sufficient coverings during the really cold nights. Daily bathing in the mountain streams, and not too much riding, will give them unheard-of appetites and make new creatures of them in short time.

"October is perhaps the prettiest month in Honduras. After the long months of the rainy season, the look of the world is enchanting. The air is clearest then, for the rains have washed out all of the dust. Miles and miles across splendid emerald valleys are distant mountains veiled in sapphire and azure. Sometimes, beyond low floating snowy clouds, rise dark-green peaks like islands in an aerial sea. The flowers are all at their best.

"The road-sides in places are ablaze with yellow and scarlet. In other, shadier spots there are ferns and orchids. On a mountain-side where a thousand tiny streams trickle constantly down across your narrow path, there is maiden-hair, delicate and beautiful beyond description—inexhaustible quantities. And mingled with it are begonias that you instantly crave to transport to the North. Further on are giant ferns, amazing trees that make you stare. In another place you will find blackberries growing wild—bushes and bushes, limitless and unheeded. But it is the very same old blackberry—red when it is green—that you have eaten all the summers of your life since you were old enough, in the North. The natives call it the mora. And everywhere you will see the mimosa, the sensitive plant, which in the tropics becomes quickly a tree, and does not quiver and recoil so easily

at rude contact. There are two species—one with little pink fuzzy balls, and one whose fuzzy balls are yellow.

"O, how truly beautiful is the spring-like October of the Hondrus uplands!"

Again:

"There are people who should never go to Honduras. These are persons lacking in steadfastness of purpose; irresolute, easily discouraged folks. They are the class that soon become disgusted with the life, and set up a tremendous wail to return to civilization as they call it. They are people who have not the slightest idea of adapting themselves to circumstances and getting



PATUCA RIVER, AT HIGH WATER, NEAR THE MOUTH OF THE WAMPU.

at the best side of life. They are utterly incapable of learning Spanish for one thing; they have no desire to learn it, indeed. They depend on others to interpret for them, and when there is no one at hand to do their talking for them, they are miserably helpless. Such are some of the employes of the mining companies. They spend a year or two in the country, grubbing along at their work, and grumbling at the cruelty of Fate in bringing them to such a spot. They draw their salaries with a vindictive air, as if their only remaining satisfaction was in knowing that the company had to count out so many silver dollars every first of the month on their account. These people

finally return to the United States no wiser, no better off—save for their paltry earnings—for their experience in the tropics, than so many horses or oxen would be. And these are the people, I believe, who make the ridiculous and deprecating reports of Honduras that we sometimes read in the newspapers. They do not scruple to assert that the country is inhabited by half-nude savages; that life is unsafe, and that outrageous liberties are taken with the property of foreigners. These are the people who would have you believe that your letters are opened in the post-offices, and that espionage of the most annoying sort exists. No stories of the sort should be credited. The post-office authorities are too busy to meddle with any one's correspondence. They would consider it a great bore to devote unusual attention to any letter or package, unless there were reasons to apprehend smuggled goods or the violation of the postal laws."

Again:

"The Hondureños are a peaceful and friendly people. Exclusive of a few of the Indians in the remoter districts, they are wonderfully kind and hospitable to all strangers. You can travel from Amapala to Puerto Cortez, alone and utterly unarmed, with any amount of money and jewels upon your person, and have no fears whatever."

And again:

"Lemons grow abundantly on the coast lands and limes in the interior. Mangoes grow almost everywhere. From the mangoes delicious preserves might be made, or the fruit could be canned for exportation. Figs in a similar shape could, I think, be profitably sent to North America and Europe. Pomegranates and grandillas are plentiful and are not so perishable.

"On all the north coast lands there are found a great variety of other tropical fruits, whose cultivation might well be included in a plantation. Some of these are guavas, anonas, melons, aguacates, plums, sapotes, olives and negritos.

"From fruits we may turn to other vegetable products which may be cultivated. Of these cotton, tobacco, indigo, vanilla, cocoa, pimento, ginger, pepper and capsicum might well be considered. A general farm in any mountain locality might include potatoes, rice, wheat, corn, yams, plantains, beans, and all the temperate zone vegetables, such as tomatoes, string beans, peas, cabbages, beets, turnips, cauliflower, lettuce, cucumbers, squashes, musk-melons, celery, radishes, etc.

"The Honduras tobacco is of excellent quality. Cotton was grown twenty-five years ago in the country by an American from Georgia, who undertook its culture somewhat as an experi-

ment. He chose the neighborhood of San Pedro Sula, the present inland terminus of the railroad line starting from Puerto Cortez, and there planted several acres with seed he had brought from his home in the States. It was that called the Sea Island variety. He succeeded in producing cotton trees having stalks seven and eight feet high and measuring fourteen in circumference. He was able to gather three or four times a year the pickings producing five hundred pounds to an acre. This plantation yielded well for ten years or so, at the end of which time the trees seemed to run to wood. There is a native cotton which nearly always has a pale-reddish fibre. The chief obstacle would seem to be the scarcity of labor, rendering it impossible to get the cotton picked properly. With sufficient capital, and perhaps a certain amount of imported labor, one could look for large profits. Negroes from the United States, who understood how to do the work, would naturally be the best hands to have. One should set up his own gins and presses, and go into the industry with zeal and determination.

"The wonderful wealth of Honduras in her forests alone can hardly be realized without visiting the country. Mahogany, cedar and rosewood are the principal cabinet woods exported. The mahogany and rosewood are most plentiful on the north coast; the cedar is quite common in all the departments. It is found in great abundance, as also is the *lignum vitae* in Comayagua. Near the Sulaco River there are some remarkable qualities. There are noble forests of oak, pine, ronron, walnut, live oak, higueron, guayacan, ceiba, masica, granadilla, greenhorn, tuberosa, alazar, guano, tamarind and mulberry for silk-worms. Olancha and Colon have magnificent natural resources in this direction. From the coast to Juticalpa, along the Guavape or Patuca and the Guayambre, are forests of balsams, mahogany and cedar, and vast tracts of pine. The dye-woods are abundant—logwood, fustic, Brazil wood and others. The medicinal trees and plants include the sarsaparilla, ipecacuanha, castor oil plant, Peruvian bark, etc. The trees yielding resinous products comprise the copal, guapinal and balsam. The hule, or rubber tree, abounds on the coast."

From the Diary of W. W. Packer, of Sabanagrande, Honduras:

"On the morning of the 9th we continued our journey, entering Rio Patuca at 11:51 A. M. Its beautiful banks were like a terraced lawn, a fringe of heavy grass against a background of forest. I began, almost unconsciously, humming from Haydn's

Creation, "Most beautiful appear," for the rich, fertile lands and fresh verdure suggested not only beauty, but a grand future of wealth to those who were here in this paradise. Of crocodiles there were many, an enormous fellow lying on the bank in easy range, tempting me to salute him. My salute was forcible as a Colt's 44- revolver could make it, and as the leaden compliment went to him, it glanced from his scaly covering as harmless as flattery tossed to an experienced society belle. Mr. Hines' rifle caused another leviathan to toss his head, and with a loud voice acknowledge that he felt hurt at the presumption. Through the beautiful lands, amid forest and savana, we went all day, till, at 7 P. M., we entered the hospitable house of Mr. Nestor A. Gross, and I spent a good part of the night in talking with him and Mr. Charles Coleman. We shall long remember the sack of flour and the cut loaf sugar—a gift—for, as we lunched on batter cakes and turtle eggs, we thought of their liberality with every liberal mouthful.

"The next day, while eating of the flesh of a very tender iguana, I looked at the face of an enormous cliff, and wondered if, amid this beauty on one side and the fertility on the other, the crocodile should monopolize it, or a teeming population of workers find health, sustenance and life.

"Our return journey is of necessity slow, and as I stand in the water after wading, and wait for our boatmen to reach us, I improve the opportunity by committing to memory from a Spanish book a number of verbs and nouns; also a few phrases. My neighbor smiles at my energy under the circumstances; but it is all the chance I have, and the boatmen wonder why I do it (for have I not some one with me who can speak for me?) not knowing that one of the joys of existence is to do your own talking; and this is no dreary, poorly ventilated school-room, but in each breath of Honduras air there is an impulse to do and persevere.

"One thing we failed to do—secure any steaks from the enormous tapirs that frequent this region. We have shot three, but they have died in almost inaccessible places, and our time has been of 'more value than many *tapirs*.'

"We are, on the 14th of January, at camp on a sandbank. A hut covered with twenty-nine plantain leaves is sufficient shelter against the weather; but we must sleep lightly, for on one side is a mountain swarming with jaguars, twenty-seven feet from our hut the crocodile marks of to-day, and with us five beings who have not yet known what Matthew Arnold called 'the humanization of man in society,' viz., civilization, and who have not forgotten that we took them, with no very gentle words.

from their hunting and fishing, to toil here for money which they do not worship. Our guide and his family have deserted, so we have only five attendants left, and they would rather hunt and swim than continue the journey. Onward we go, however.



TALL TIMBER—HONDURAS.

carefully watching, and at last we reach the hut where I am writing. Close by us is a wild cotton plant, so large I hardly dare speak of its size. Mr. Hines has crawled into it four feet

from the ground, and, stretching his hands upward, asks for a stick to touch the top. Nearly three hundred bolls of superfine cotton growing, and so each of us must secure a quantity of seed to send to North America.

"I wish I could tell you more of this choice spot on earth, but till our road is made you will prefer to delay coming. In two months we expect to have reduced the time four days, and made stations that one may travel with a surety of comfort which we long for, as at present we are very tired. Not one hour for sixteen days have we had dry clothing, or a dry blanket at night, except the one night when we found a dry bed at the house of Mr. Gross. We are well, however, which is the best evidence that the climate of Honduras is par excellence, and that we are tough."

DEPARTMENT OF COMMERCE AND LABOR—BUREAU OF MANUFACTURES.

DAILY CONSULAR AND TRADE REPORTS.

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HONDURAS.

EXPORTS AND IMPORTS—SHARE OF THE UNITED STATES.

No. XXX.

Special Agent Lincoln Hutchinson, writing from Amapala, May 1, furnishes an interesting report on the commerce of Honduras. An examination of the figures shows the United States occupies a prominent position in the Honduras trade. Of the total imports for the year 1905, 50 per cent. came from the United States, and of the exports, which were double the value of imports, the share of the United States was about four-fifths. Mr. Hutchinson's letter follows:

The Statistical Office of the Government of Honduras has recently prepared a statement of the foreign trade of the country for the last fiscal year, ending July 31, 1905. The figures are of considerable interest, as emphasizing the preponderance of the United States in the commerce of this Republic.

The total imports of the country for the year were valued at \$2,362,760, and of this amount the United States furnished \$1,689,900, or over 70 per cent. The exports were more than twice as large as the imports (\$5,564,003), the United States taking \$4,622,700, or more than 80 per cent. The share of other countries is shown by the following table:

Country.	Imports.	Exports.
United States	\$1,689,900	\$4,622,700
England	212,800	85,500
Germany	185,000	217,400
British Honduras	95,000	74,400
France	66,500	3,600
Nicaragua	56,600	15,500
Spain	21,300	....
Salvador	8,400	18,600



PRESENT METHOD OF TRANSPORTING FREIGHTS
IN INTERIOR HONDURAS.

China	8,000	....
Japan	1,800	....
Guatemala	1,600	130,000
Cuba	900	391,100
Panama	200	1,300
Costa Rica .....	....	3,800
All others	15,000	....
Total	<u>\$2,362,800</u>	<u>\$5,564,000</u>

The principal items of export are the various natural vegetable products of the country, these reaching a value of \$2,593,700. Mineral exports were valued at \$1,998,700, and animal at \$909,000. Among the vegetable products exported bananas are by far the most important, the total value of shipments being \$2,078,400. Cocoanuts come next, with \$210,900; then hard woods, with \$128,100; rubber, with \$83,900; coffee, with \$52,700, and sarsaparilla, \$30,000.

The chief mineral export is copper, \$1,154,000; gold and silver make up most of the balance, \$813,700. The only important animal products exported are cattle, \$595,600, and hides and skins, \$298,000.

POSITION OF THE UNITED STATES.

The report from which the above figures are compiled illustrates the great strength of the United States in the markets of Honduras, but it fails to reveal the equally important fact that the commanding position of the United States has been attained only in recent years. Ten years ago the sales of the United States to Honduras were not only much smaller in absolute amount, but they constituted a far less important share in the total purchases of that country. And the increase has shown itself not merely in one or two classes of goods, but in nearly every important item of our trade. The following figures illustrate the development of exports from the United States to Honduras, values being stated in thousands of dollars. The figures represent annual averages for two five-year periods stated:

Class of goods.	1895-1899.	1900-1904.
All food stuffs, including breadstuffs, provisions, wines, liquors, etc....	131.6	220.3
Cotton Goods	181.4	278.9
Iron and steel, and manufactures of..	92.6	151.1
Chemicals, drugs, medicines, etc....	35.4	51.3
Explosives	21.7	42.9
Quicksilver	43.3	47.9
Wood, and manufactures of.....	20.0	38.9
Leather, and manufactures of.....	14.7	33.2
Sugar and molasses.....	14.4	20.4
Oils	10.5	19.1
All goods	667.2	1,057.2

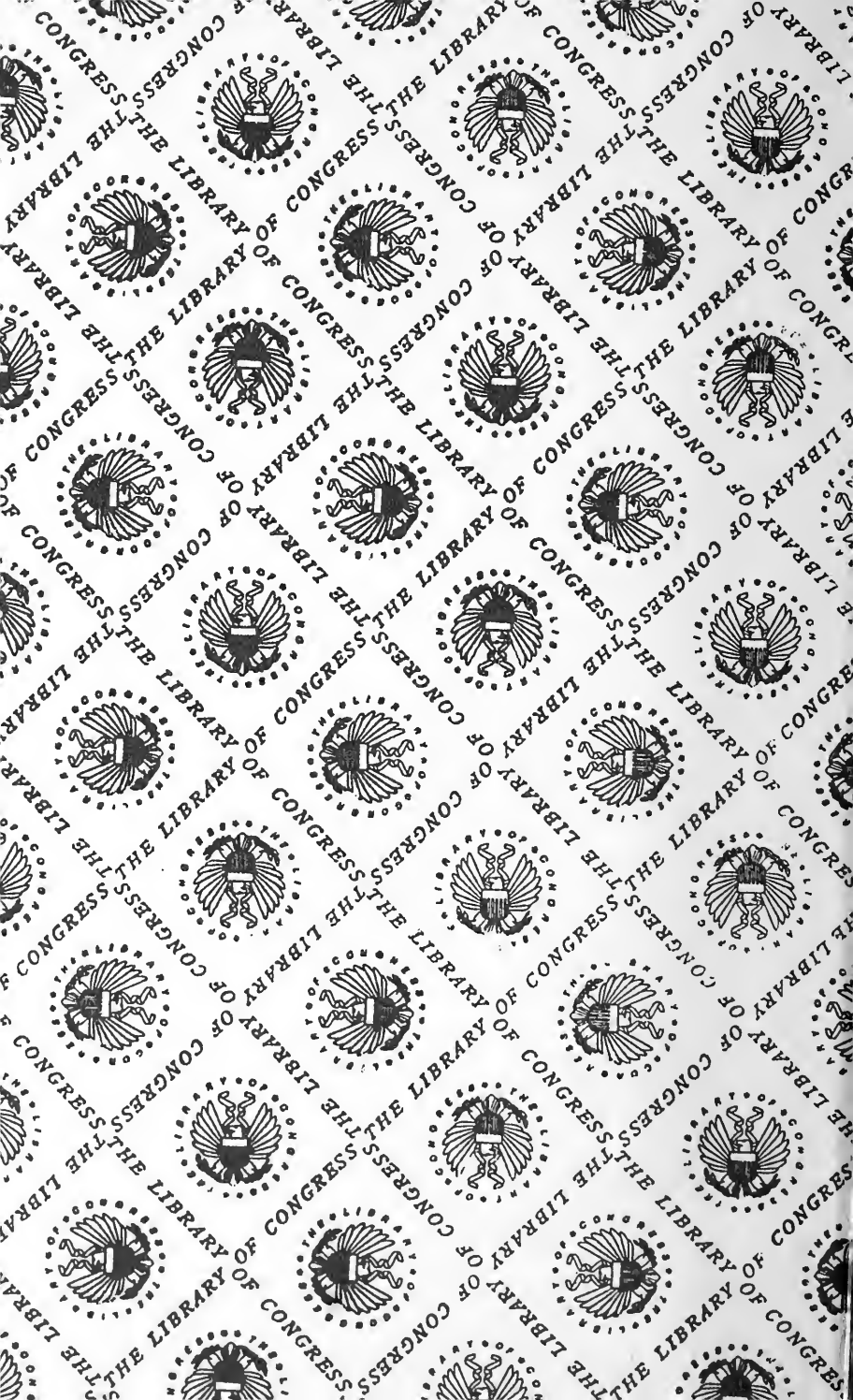
The only goods showing a decline between the two periods are a few unimportant ones: Scientific instruments and apparatus, \$5,700 to \$4,500; notions, \$2,300 to \$1,900; soap, \$8,100 to \$6,600, and bottled wines, \$2,100 to \$1,400.

Besides the foregoing more important classes of goods are many others which show a similar increase—paper, candles, cars, carriages and other vehicles, coal, earthen and china ware, glassware, rubber manufactures, lamps and chandeliers, matches, oilcloths, paints, etc., perfumery and cosmetics, manufactures of straw and palm leaf, tinware, etc. The rapid rise of the United States to the controlling position in the commerce of Honduras is but one of many illustrations of what our exporters may do in time in many parts of Spanish-America.





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